A Personal Guide to Personal Computers

A P P L E C O M P U T E R

$2.95

A Personal Guide to Personal Computers

By Peter Lundstrom

Illustrations by Don Weller

Apple Computer, Inc.
20525 Mariani Ave., Cupertino, CA 95014

Design: Russell Leong
Illustrations: Don Weller
Art Direction: Phil Raymond , Russell Leong
Production Coordination: Debi Lorenc
Production: Rick Wong
Editorial Assistance: Karen Steele
Apple Marketing Consultant: Bill Cleary

Acknowledgements

The sidebar on page 11 is excerpted from *Apple Magazine*. Portions of the glossary are from "In Other Words," which appeared in the December, 1981, issue of *Popular Computing* magazine. Copyright 1982, Popular Computing, Inc. Used with the permission of Popular Computing, Inc.

Special thanks to Monte Lorenzet for his days of thoughtful editing and months of steady patience.

ISBN 0-9609780-1-1

Table of Contents

Introduction 5

What Will A Personal Computer Do For Me? 7

Seven Powers

Managing finances
Word processing
Education
Record keeping
Entertainment
Telecommunications
Programming
Summing up

How Do I Shop For A System? 15

The Computer System

Hardware
Input
Output
Ready to go
Software
But wait!
Summing up

How To Buy Software

Software comes first
For instance
Caution #1: Quality
Caution #2: Compatibility
For instance, cont'd
Toss out the turkeys
Four factors

How To Buy Hardware

The question, again
Less power vs. more power
Four factors
Power
Simplicity
Cost
Service
Summing up

The Computer Store

The stores
Sales people
Service and support

How Do I Run This Thing? 31

Getting Started

Setting up
Loading the program
Using the program

The Real World

Other programs

What Will It Cost? 37

Typical Systems

System #1
System #2
System #3
Expandability

Costs And The Future

Questions And Answers 41

Apple Systems 45

Glossary 46

Introduction

The Computer Revolution is over.

They won.

Whether humankind won as well is still being debated. Everyone is glad for direct dialing, of course, but then there are the waves of junk mail and nine-page utility bills, of bank problems and synthetic telephone voices, of arbitrarily transmuted personal names and habits. And behind it all, for good or ill, hums the computer, the blindest of social engineers, an electronic arbiter before whom there is no appeal.

But a second, happier computer revolution is already under way. This one is shifting computer power from the hands of the few—those who control the giant computers—into the hands of the many. The instrument of this revolution is the personal computer. It's putting computer power, for the first time, at the disposal of individuals.

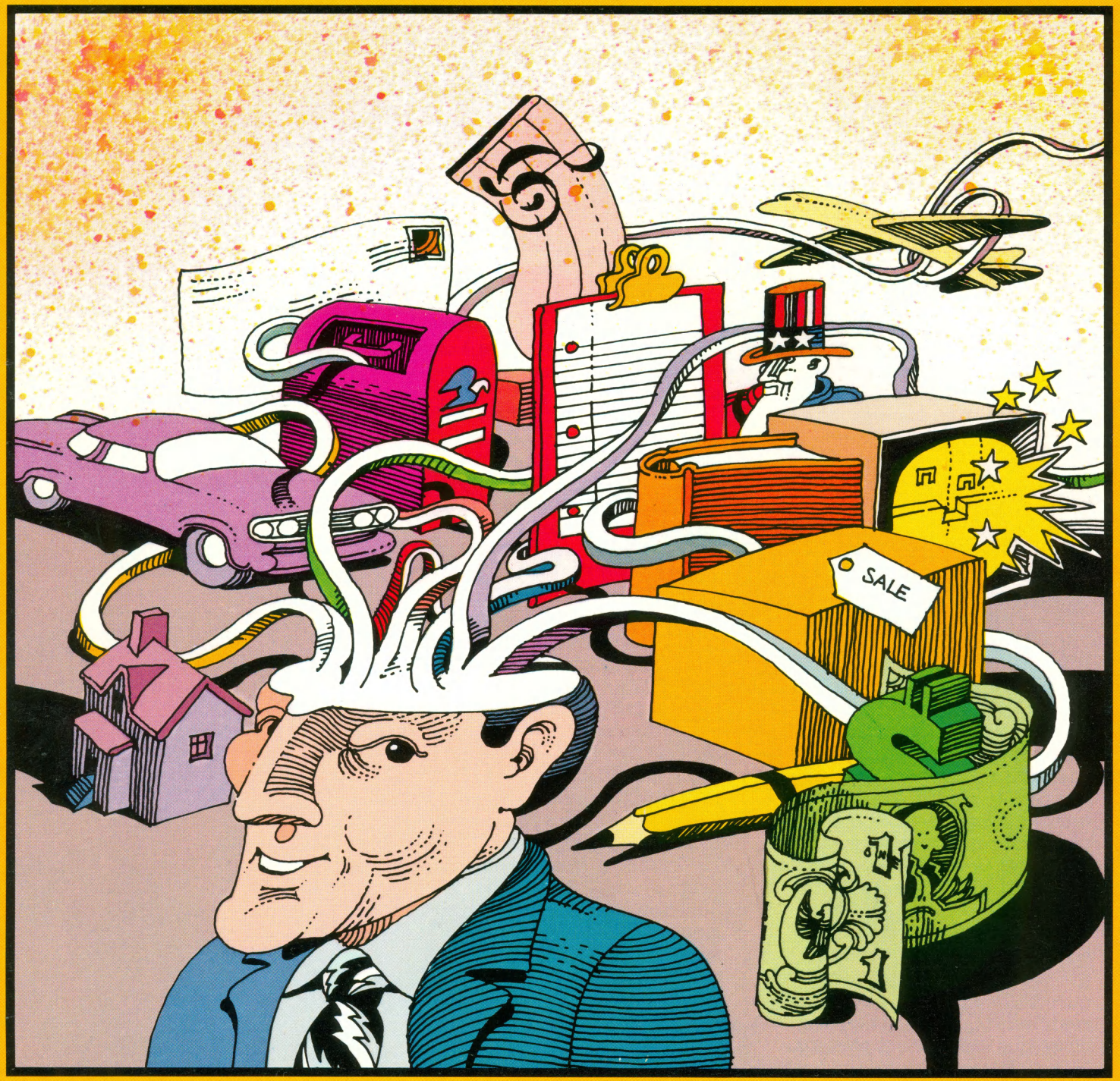
What can you do with this power? You can put it to work producing answers to personal questions—questions about investments, taxes, and housing costs; questions about personal files and records; questions about business management, budgeting, and forecasting; questions about history, chemistry, astronomy, mathematics, languages, and art. Questions about almost anything.

You don't need to be a technophile to get started, either. Instead, you simply answer a few basic questions: What is a personal computer? What will one do for me? How do I shop for one? How do I run it? What will it cost?

These, in fact, are the questions addressed in this book.

The first question may be the simplest to answer. What is a personal computer? It's a tool for making personal solutions, just as a telephone is a tool for making personal communications. To understand the personal computer's usefulness, this common sense description is all one needs to know.

In fact, common sense is the best approach to the other four questions and to computers in general. It frees one from the fear of computer jargon and technical arcana. It helps one get to the point. It's the approach that this book strives to maintain.


SALE

What Will A Personal Computer Do For Me?

What an auto does for your body, a personal computer does for your mind, taking you across intellectual distances that you'd have neither the time nor the stamina to cross on your own. Most important, the personal computer's instant adaptability lets it carry you in virtually any direction you choose.

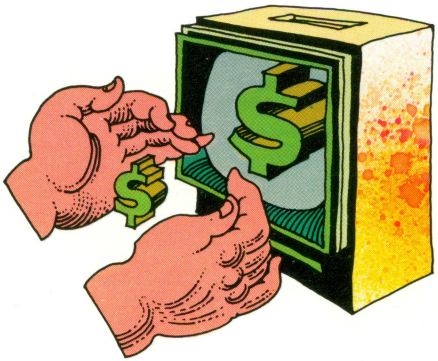
Seven Powers

In a general sense, personal computers have seven application areas. You may be surprised to find how many of them are already familiar to you.

Managing finances. A personal computer is a powerful tool for riding herd on your money. At home, it keeps track of budgets, mortgages, depreciation, tax records of all kinds, auto expense records, income and expenses for church groups or clubs — you get the idea.

A personal computer also makes it simple to see the differences, in dollars and cents, between various complicated repayment schedules on homes and cars. On these and other expensive purchases, a personal computer can actually save you enough money to pay for itself.

A personal computer can help you make better long term investments, too. Growth in money markets, T-bills, and IRAs can all be forecast and compared side by side. If you play the stock market or invest in property, you can compute a truckload of variables that will help you find a good buy and steer clear of a bad one.



In addition, the personal computer is useful for managing business finances. Its prodigious number-crunching ability makes it an indispensable accounting tool. You can also use it to do sophisticated business analyses—forecasting, statistical surveying, financial modeling, and more.

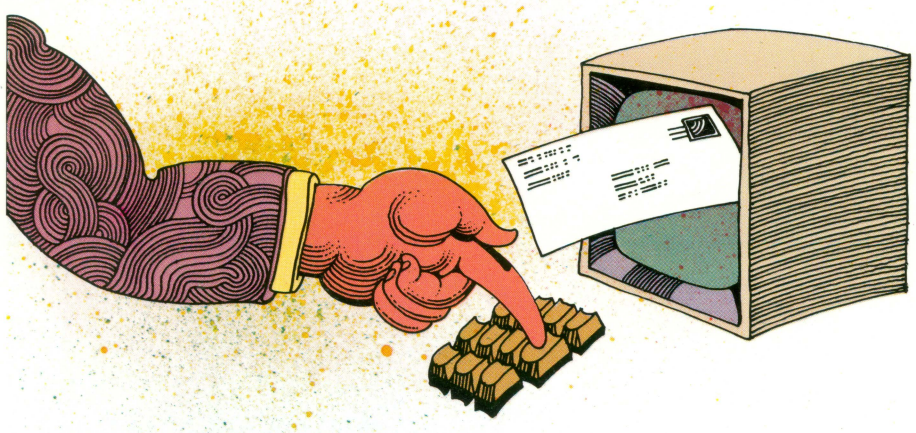
Word processing. Word processing—the next giant step beyond typing—a perfect application for personal computers. Like a typewriter, the personal computer lets you type any document you want. But the computer lets you rearrange what you've written, instantly displaying your new version on the computer's video monitor. You can weed out typos, correct your syntax, even try out a new page format. The computer instantly adjusts the entire document to accommodate the most major or minor changes. When all your changes have been made, the computer records or saves the document on a disk. You can store all your work there until you wish to review or further revise it. Hook the computer to a printer and you can

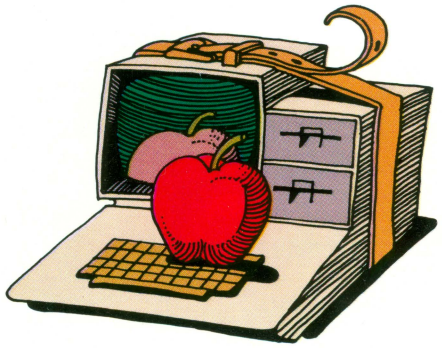
print that document, letter-perfect, automatically.

Consider an example. If you had typed this entire book on a personal computer set up to do word processing (as this writer did, incidentally), it would be easy to delete this sentence without having to retype the entire manuscript. You would simply tap two or three keys. The computer would take out the sentence and adjust *all* the following copy, filling the space where the sentence had been. You could insert a new sentence — or chapter—just as easily.

Because word processing makes changes easier, it encourages your best writing efforts. You can compose as you go, deleting parts that aren't leading anywhere and stitching together those parts that you want to develop. Many people end up writing in the same, spontaneous way they think—trying a number of approaches and quickly compiling the best parts of each. In the end, because word processing enormously speeds the process of making changes, it makes even short documents far easier to compose—and often far easier to read.

Education. Adaptable, never tiring, and fun to learn from, the personal computer is a potent tool in education. It's a natural





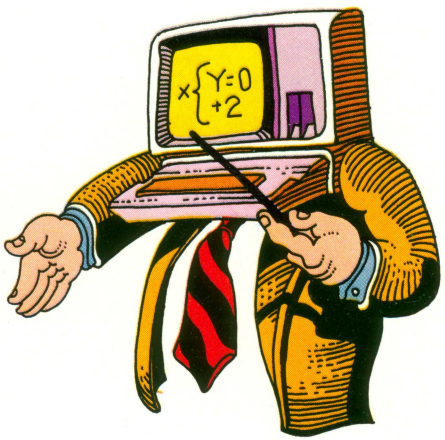
with subjects that require drill and practice, such as spelling, multiplication tables, foreign language vocabularies, and sight reading in music.

The computer gives the student an exercise and he types in a response. The computer then evaluates the response, adjusts itself to the student's skills, and poses exercises at a more appropriate level of difficulty. A personal computer gives a student undivided attention, too. The machine advances the student at his or her own pace, selects areas that need attention, and gives encouragement with congratulations and entertaining visual effects. Best of all, since students are in charge of the computer,

they find themselves in charge of their own education. Their sense of accomplishment flourishes.

A personal computer can lecture as well, combining text, music, and graphics—illustrations, diagrams, charts, even entire video tapes—to teach anything from auto maintenance to art history. When lecturing is combined with drills and practice, students can be quizzed, evaluated, given the results, and reviewed at the same time.

Personal computers also play educational games, everything from skill games that teach hand-eye coordination to math games that teach players how to run a small business.



When the world first encountered the copying machine, the stereo record player, and the hand-held calculator, understanding their function wasn't a problem. The copying machine copied, the calculator calculated, the record player played records.

But the personal computer doesn't have a single, definitive role. One minute it's an enormously powerful calculator, the next minute it's a word processor, and the next minute it's a game machine. Small wonder that a first encounter with a personal computer can produce a cloud of confusion.

The confusion begins to lift when one recognizes the difference between computers and computer *programs.*

The personal computer is simply a program player. Its single function is to run whatever program it is fed—economic model, word processing, or game—in the same way a record player runs Tchaikovsky, Miles Davis, or Rodney Dangerfield.

It follows that software is of first importance, inasmuch as it determines what the computer does. Bad software, like bad records, makes even the best hardware perform badly.

Some of the best games teach students through fantastic simulations.

A simulation is simply a computerized representation of something else in action—anything from a lunar lander or a nuclear reactor to the food chain in a fresh water lake. Students makes decisions about the vital factors that control the simulation. To save fuel, should the lander descend faster—or slower? Will using the reactor's backup cooling system prevent a meltdown—or cause one? Will removing the lake's algae help or hurt the fish? Students make the decisions and the computer instantly adjusts the simulation's action. Immediately, the students see the consequences of their decisions on the entire simulation and gain first-hand experience solving complex, interrelated problems.

Finally, using a personal computer is educational in itself.

This is no small matter, since the widespread use of computers in business, education, and the home means that everyone will soon need a basic knowledge of computers. There's no easier or more effective way to gain that knowledge than having your own personal computer.

Record keeping. If computers have an insatiable appetite for anything, it's long lists—the longer, the better. With the right program (there are many on the market), a personal computer will help you catalog virtually anything—business files of every sort, personal tax records, parts inventories, private libraries, recipe files, even information on which fishing flies work best in which streams.

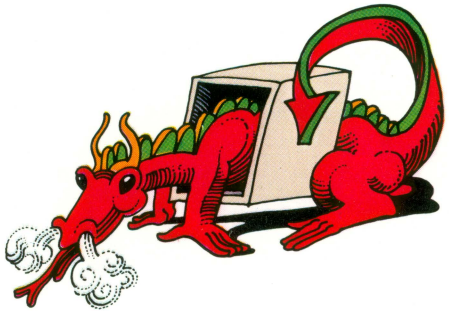
Keeping these records electronically is fast and convenient, but that's just the beginning. A personal computer will also automatically cross-reference nearly any combination of topics you care to examine.

For example, at tax time, you need to find your deductible expenses. With a personal computer, you can automatically sort through your entire electronic file of receipts and, in seconds, locate all those marked "deductible."

But you also need to further classify those deductible receipts as "medical," "business," and so forth. Command the computer again and it will perform this task almost instantly.

Finally, if you were curious about the number of deductible business lunches you had with John Locke, your attorney at Locke, Stocke, and Barrell, you could command the computer once more and have your answer.

All this, and you'd never once have to wade into closets and drawers to look for your old files.



Entertainment. Personal computers don't just toil, however. They also play some pretty impressive games. All the most popular arcade games—invaders, lunar lander, and far more—are available in scaled-down versions.

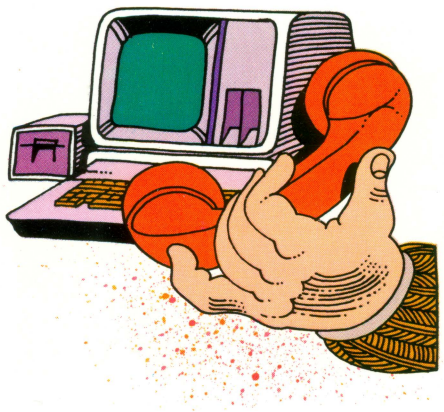
But personal computers also play a type of game that has yet to appear in any arcade. These are the vastly imaginative 'adventure' games. They're actually simulations that put you in the midst of all kinds of fantastic situations and invite you to work out your own solutions to their challenges.

The most popular kind of adventure game lets you explore an underground labyrinth filled with treasure—and danger. The object is simply to explore, defeating disaster and gathering

wealth, and get back alive. You command the simulation in plain English, which the computer is programmed to read. Depending on your command, the computer serves up the appropriate next step in your adventure—onward and downward, toward waiting dragons, sorcery, and gold.

Telecommunications. This simply means letting your computer use your telephone line (via a handy gizmo called a modem) to communicate with other computers.

Think about the possibilities. You can work at home, using your personal computer and



"We bought our personal computer for our 13-year-old son. We thought Rick might try writing a few simple programs himself." Thus did Lou and Adela Parada of Pinole, California, keep Rick occupied for the summer.

They succeeded beyond their wildest dreams.

At first, Rick and his family used the system for games. However, he soon read the tutorial manuals that came with the computer and taught himself how to program in BASIC. Within a month, he was writing programs for his mother's T-shirt business.

Mrs. Parada stocks 850 different T-shirt transfers, 150 silk-screen designs, and 30 shirt styles—in a variety of sizes and colors—from 10 suppliers. Record keeping was slow and difficult until Rick put the computer to work on the problem.

Rick's programs save his mother time reviewing invoices and counting inventory. One program identifies all available transfers by supplier, order number, category, and wholesale value. It also keeps a record of purchase dates, figures out the quantity at hand, and calculates the wholesale value of the entire transfer inventory. A second program keeps a detailed record of daily sales, figures the cost of goods sold, and calculates total sales tax payments.

Rick has written other programs for his mother's business. He also does some programming for his school and uses the computer to do homework.

As they've increased their use of the computer, the family has added new equipment, including a printer, disk drives, and new software. Mrs. Parada uses several commercially available small-business programs. One of them, a general ledger program, saves her the $100 per month she used to pay to a computer service bureau. Another program keeps a budget of both home and business expenses.

Mrs. Parada recommends the system to friends and other businesses. "The benefits to our family, to our business, and especially to our son have been phenomenal."

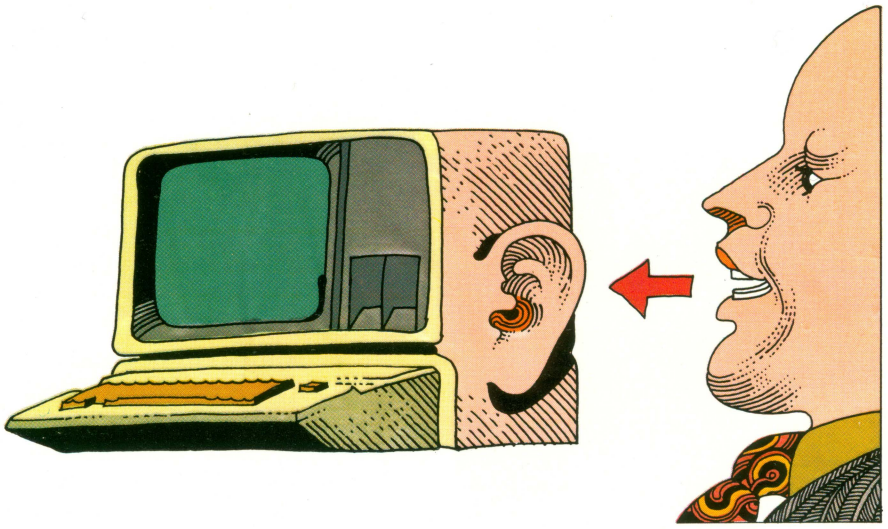
your phone to talk with your office's main computer. Or you can get late-breaking stock prices by connecting your personal computer to big computers in New York via telephone. Link your computer to computers in Chicago for information on commodities trading, or call someone else's personal computer to leave short messages or 40-page business reports. Others can contact your computer, too, and deliver information you need.

With personal computer telecommunications, you can also shop by computer catalog, browse through specialized computer libraries, do your banking, and more. All of these transactions, of course, take place at the speed of light.

Programming. Programming is nothing more than making up your own instructions for the computer in a language it can understand. Learning a computer language—BASIC or Pascal, for example—takes time and work, but is generally a lot easier than learning a human language like French or Latin. In fact, you can learn enough in just a few hours to write elementary but useful programs.

Programming lets you apply the power of your personal computer to the area of interest that suits you. Care to examine the aerodynamics of insect flight? Want to re-enact the world chess championship of 1958? Feel like experimenting with designs for a summer house? If you know how to program, you can tell the computer to come up with just the answers you're looking for.

Summing up. A personal computer can vastly supplement your abilities in seven broad areas—finance management, word processing, education, record keeping, entertainment, telecommunications, and programming. The personal computer enables you to use its enormous data-crunching powers to reach formerly inaccessible solutions involving money, paperwork, class lessons, record keeping, games, communications, and just about anything else that interests you.



When you bring a personal computer into your home, you can plug into the whole world. Your computer can be equipped to join networks of computers all over the globe, computers containing vast quantities of every kind of information. You can even do office work at home by hooking into your company's large computers.

This kind of computer-to-computer communication is called telecommunications. It's made possible by using your telephone (and/or certain specialized communications lines) to link your computer to something called a data base, a library of information (data) stored in a computer.

The number, variety, and uses of data bases now available over public networks is impressive. You can use them to visit with friends, send and receive mail, store facts or shuttle them from remote file to remote file, search libraries, take part in conferences, rent a car, select and pay for a TV set, run your own business, monitor stock and commodity prices, search for information on a multitude of subjects from abortion to zoology, play games, and even publish a novel. You can link your computer to hundreds of libraries that you may search and use without ever leaving your home. And because these libraries are electronically updated, their information is always current.

Two popular networks, The Source℠ and CompuServe,™ offer a wide range of information and communications services, including in-depth Dow Jones™ stock statistics and general news service, the UPI news wire, and a composite of stories from 11 different news sources.


SALE DIS
FOR SALE

How Do I Shop For A System?

The place to start is in a computer store. However, your visits there will be more fruitful if you first learn a bit about computer systems in general.

The Computer System

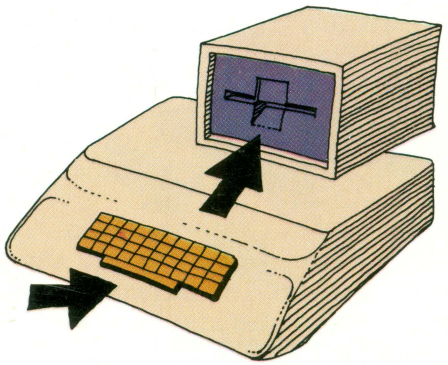
Hardware. At the heart of the system is the computer itself, usually a low box with a keyboard that looks something like an electric typewriter. Inside the box are the computer's power supply, circuit boards, and other electronics. The computer does all the "thinking"—simple calculating, really, but at blinding speed.

Yet the computer alone has no communication to or from the outside world. Its "thinking" power remains undirected and useless until two important components are added: first, a device through which a user can tell the computer what to think, and second, a device for communicating the computer's results. In short, a computer needs data sent in—input—and it needs to send data out—output.

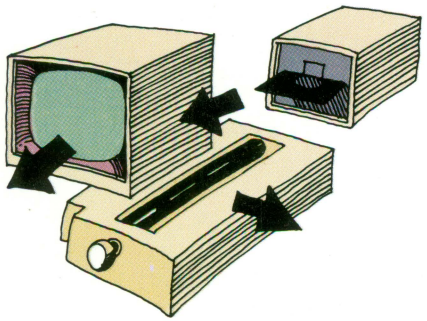
With its input and output attachments, the useless computer now becomes a useful computer *system*. You can classify almost all computer attachments as either input devices or output devices.

Input. For entering information into the computer, the two most common devices are the keyboard and the disk drive. The keyboard lets you enter in any information you choose. It's especially useful for composing the very long sets of instructions—programs—that prepare the machine to crunch numbers, process words, and so forth. But the keyboard is slow. If you had to send the computer every program you use via the keyboard, you'd spend all your time typing and precious little time computing. You need a way to send precomposed programs to the computer at more computerlike speeds.

That's precisely the function of a disk drive. This little machine, attached or built into the computer, "reads" information stored on a floppy disk, a removable recording disk that looks like a small, flexible 45 rpm record. The disk drive then feeds the information to the computer in seconds.



Output. Personal computers send out information in two ways. The first is via a small TV or a special video monitor. Plugged into a TV or monitor, your computer can instantly display numbers, words, and pictures on the video screen. The second way is through the disk drive, which can "write" information as well as "read" it. The computer sends its data to the disk drive, which quickly records the information on a disk.



Although almost all computer attachments can be classified as either input or output devices, the disk drive is an input *and* output device—an I/O unit, in computer jargon. With a keyboard and monitor, plus this I/O device, you and your computer can communicate freely.

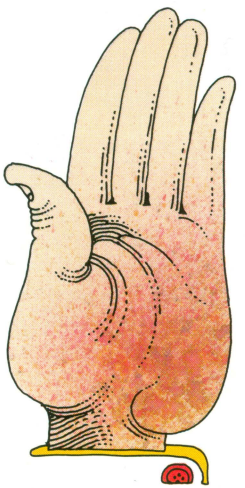
Ready to go. Now the computer has what it needs to be used by people. Input goes to the computer via the keyboard and/or the disk drive. Output is sent from the computer to the monitor, where you can look it over, or to the disk drive, where you can store it for later use. With these basic devices, you and your computer can begin to talk to each other. But what will you talk about? This is where software comes in.

Software. Software is the generic name for all computer programs. A program itself is simply a list of thinking directions you give a computer. Though you can learn to write your own programs, you certainly don't have to. Most personal computer users buy ready-made programs, then feed them to the computer via the disk drive.

Once instructed by the program, the computer is ready to respond to you. For example, if you load a computer with a calculating program, the computer acquires the ability to add, subtract, multiply, divide, and much more. Now you can type in formulas and equations and tell the computer to manipulate them for you. Similarly, a word processing program equips the computer with a catalog of skills for manipulating words, paragraphs, and pages. You put those skills to work on the words you type into the computer.

Because it completely controls a computer's "thinking," software is as important as hardware. Clumsily composed software will force even the best computer to think clumsily. Cleverly written software, on the other hand, will make your computer a better thinker and easier to use. For these reasons, the quality and quantity of compatible software should play a major role in determining the brand of hardware you buy.

But wait! It's extremely important to think about service as well. A computer system is a big investment and needs to be protected by reliable service policies and competent service people. A short section on this subject appears in the "How To Buy" discussions on pages 27 and 28–29.



Summing up. Now you have three categories to think about — hardware, software, and service. Hardware means the computer and its I/O devices, such as the machine's keyboard and disk drive for input, the monitor and disk drive for output. Software simply means any kind of program, usually on a floppy disk. Like books or records, software can cover every conceivable interest, and the number of programs is continually expanding. Service is self-explanatory.

Hardware, software, and service. Those are the basics. Virtually all your computer shopping will fall into one or more of these three categories.

How To Buy Software

Software comes first. Software determines what your computer can do for you. It's so important that you should start your computer shopping by finding the software you like, then buying the computer that runs it.

Fortunately, there's an effective and nontechnical way to approach software (and computers in general). Start with the obvious. Ask yourself, "What do I want to do with this computer system?" The answer will point you to the kinds of software you want.

For instance. Let's say you want your computer to help you do family budgeting more easily and accurately. You also want it to speed up your income tax estimations and all that nasty, yearlong record keeping. You do a lot of writing, too, so you want your computer to handle all your writing projects: personal correspondence, reports for the office, your church newsletter. And games—it has to play games.

Now you know what you're looking for. You need a family budget program, an income tax program, a word processing program, and some game programs.

Caution #1. Having decided this, you encounter two important concerns. The first is quality. For the right balance of computer efficiency and ease of use, both your programs and their instruction books must be well written. You can learn about the quality of a program by asking for software demonstrations—and explanations—in almost any computer store. Also ask for the names of people who have bought the program, then contact them. You'll find their reports most enlightening.

Caution #2. The second concern is compatibility. Not all program disks run on all computers. This incompatibility is traceable to the computer's operating system.

When you buy a piece of software, you get more than the program you shopped for. Also tucked away on your disk is another program called the op-

erating system. Loaded into a computer along with the word processing, game, or other program you're using, this stowaway sets up a vital communications link between that program and the computer's "brain" or central processing unit (CPU). The operating system takes the main program's commands and passes them down to the CPU in a language it can understand.

The problem is this. There are different kinds of CPUs, and each kind understands only its own language. When a program disk's operating system doesn't speak the CPU's single language, everything jerks to a halt. The main program just can't get through to the computer's thick-witted brain.

Here is the point of all this technical talk. The largest libraries of available programs use just a few common operating systems, with names like DOS (disk operating system) and CP/M® (control program/microcomputer). Since you want as many programs as possible available for your computer, your system's software and hardware should use one of these common operating systems.

For instance, cont'd. Now back to your software hunt. You've answered the first question: What do I want my programs to do? You know you're looking for family budget software, income tax software, word processing software, and game software.

Software publishers, like book publishers, handle similar subjects in different ways. Most software publishers, for example, offer some kind of program for computing your taxes. How would you sort through all these tax programs to find the one that suits you? Generally, the same way you'd select a book on taxes that suits you.

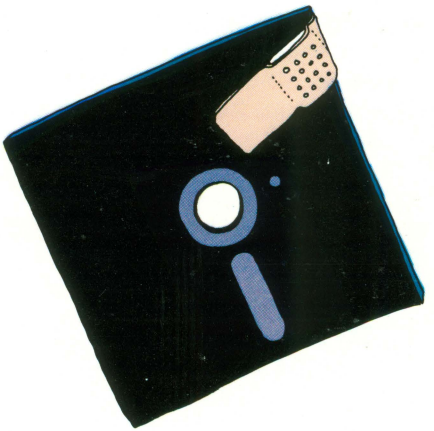
Toss out the turkeys. First, eliminate any that are poorly written. This applies not only to computer programs but to their crucial instruction manuals as well. After all, the program is useless if you can't understand how to use it. At a good computer store, you can browse through the program's instruction manual and try out the program. If the manual or the program is clumsy or just plain hard to figure out, pass up the whole package. It will cause more frustrations than it will resolve.

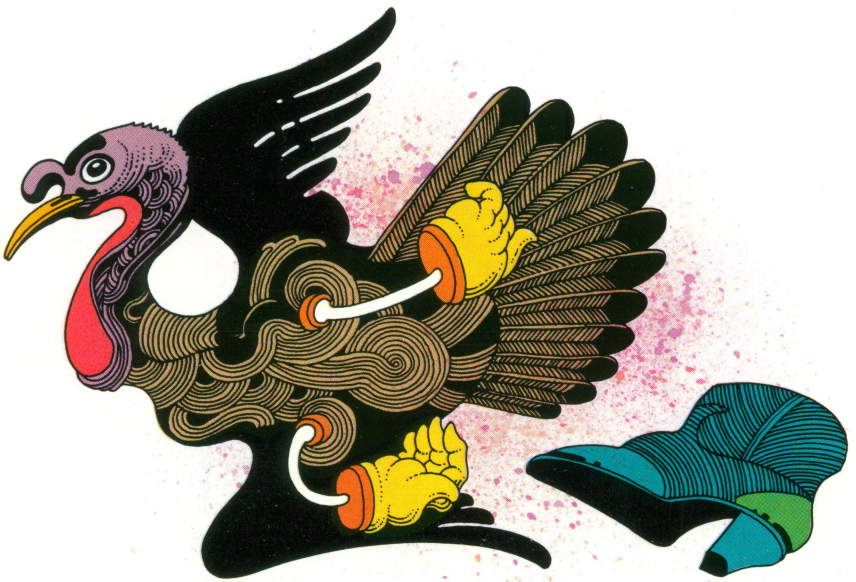
Four factors. You'll still be left with several possibilities. Take a

CP/M is a registered trademark of Digital Research, Inc.

close look at each and evaluate how it has balanced four factors: power, ease of use, cost, and support. Applied to programs, "power" refers to what they can actually do. Some programs do more than others. Some don't do as much, but are easier to master and put to use. Some do all kinds of tricks and are easy to use, but also are very expensive. Finally, if the disk develops a flaw, the publisher's replacement policy could mean big bucks saved or lost. Power, simplicity, cost, and support—you'll find that different programs emphasize different parts of this formula.

Of course, which of these variations you choose is a matter of personal preference. For example, if you want a tax program that can handle very complex problems, you'll probably favor detailed programs that are harder to master. If you want a few simple answers and nothing more, you'll probably prefer the more basic programs. If you want the simplest of ways to do the most complex problems, you'll be happy to pay extra for the hottest, slickest software you can find.





One last point. As with any fairly expensive purchase, don't choose something that won't last. Do two things. Look for software that will still be useful when you know how to do more with your machine, and, to outflank disaster, look for software with a good warranty.

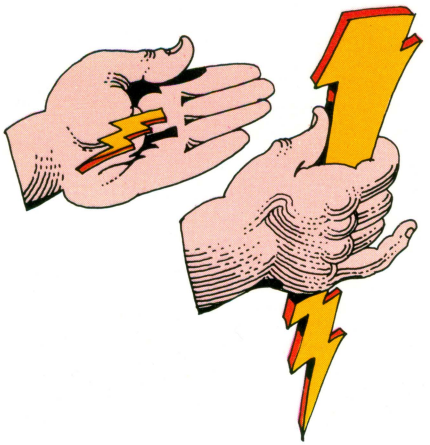
Most software publishers protect you in case of mishap. If a program disk is destroyed (it happens) or wears out (usually only after thousands of uses), they'll replace it for a fraction of its original cost. This replace-

ment is a one-time offer, of course, inasmuch as large giveaways cause software houses, like other businesses, to go profoundly broke.

How To Buy Hardware

The question, again. Begin by first asking the same basic question you asked about software: "What do I want it to do for me?" Don't be diverted by technical details. They're pertinent only to the degree that they help answer the main question. Remember, the computer is supposed to *solve* problems, not create them.

Less power vs. more power. For those who want a less expensive way to give personal computing a try, the low-cost, low-power personal computers offer a useful introduction. Two typical low-power systems are described on pages 37–39. But practical programs for tax management and word processing are beyond the abilities of the low-power personal computer. For the sake of this exercise, you'll pass them by.



What's left, essentially, are the machines you're looking for—full-scale personal computers, with a range of peripheral devices, from which you can assemble a system to handle all the work you need done, and then some.

You'll find a good many variations among these machines. Yes, this one can run tax programs, but how quickly? That one does filing, but how many files can it handle? And how easily? Others play games, but in color and with sound effects? As you examine the possibilities, you'll refine the one essential shopping question: What do I want this system to do for me?

Four factors. In the process, you'll balance the same four essential factors you balanced with software—power, ease of use, cost, and service/support. Applied to software, these questions ask how effectively a computer system's built-in potential has been put to use. Applied to hardware, they ask about the built-in computing potential itself.

As you balance each of these categories, you'll learn a few general concepts about hardware. Once you learn them, you'll find that they apply to all the personal computers you examine.

Power. The first category—a computer's power—depends on several elements. One of them is the CPU (central processing unit), the famous "computer on a chip." Although a computer is full of chips, only the CPU is capable of computing. All the others are only helpers for the CPU, simply storing information that the CPU needs for "thinking."

Personal computers may be built around one of a number of different CPUs, chips with names like 6502, 8088, Z80, 68000, and more. As you encounter each different CPU, find out

what operating system it understands. Remember that this determines how many programs can put the computer to work. Make sure that the CPU in the computer you choose understands a well-known operating system, one used by plenty of good software.

Note also that some CPUs work faster than others. This can be an advantage when you handle massive quantities of data, like a month's worth of company bookkeeping. The general rule about speed is that more is better. However, if you really need high speed, make sure that the rest of the computer will permit the fast CPU to use its speed. Some machines move data to and from a fast CPU along inherently slower data paths. This forces the CPU to wait for the information to come and go, cancelling the CPU's speed advantage. It's like driving a Ferrari in a traffic jam. So, when you hear about faster and slower CPUs, concentrate on the net effect. Will a system with a fast CPU offer enough practical advantages to outweigh its higher cost? Will the extra speed actually give you faster answers?

A personal computer, like the largest mainframe computer and the smallest electronic calculator, is an extremely simple electronic counting device. All it can count are zeros and ones. Pretty primitive, actually.

In fact, the computer would be as stupid as a stump if it weren't for its one really useful quality—blinding speed. It does all of its thick-witted sorting of zeros and ones at the speed of light.

These two properties—the computer's crude ability to differentiate zeros from ones, and its incomparable speed—are put to remarkably clever use by computer programmers. They can translate almost anything into number strings made entirely of zeros and ones. The English alphabet, chemical formulas, even moving pictures can all be assigned equivalent strings of numbers that the computer understands. That's essentially what programming is—the art of translating any and all kinds of directions into these special, computer-readable strings of numbers.

The computer's speed vastly overshadows its crude numerical abilities, allowing the computer to calculate or "crunch" hundreds of number strings every second. Following a program's number directions, the computer churns out appropriate number answers in response.

However, programmers have neatly spared the user from getting bogged down in all these numbers. They simply include one more number list that automatically turns human directions into computer number language, and vice versa. The final results get processed, flashed on the computer screen, and voila! Your answer is served.

All of which is nice to know, but no more important for using a computer than a knowledge of auto ignition systems is necessary for driving a car.

Another element that determines a computer's power is its internal memory. Internal memory is a grid of chips inside a computer that holds all the machine's knowledge. One block of memory comes already filled with important information that can't be changed by the computer. This unalterable part of memory is called read only memory, or ROM, because the CPU can "read" this data but can't "write" in any new data.

Another block of internal memory is empty and can be filled with any kind of information. All data written into this part of memory is easily altered. When you enter a program into the computer, the program is copied into this part of memory. The results that a computer generates are also "written" here. The information held in this memory block can be altered to your liking, then stored on a floppy disk for future use.

This alterable part of memory is designed to make life easy for the CPU. It lets the CPU grab needed data randomly, without wading through rows of unneeded data to reach it. Therefore, this part of memory is called random access memory, or RAM. Unlike read only memory (ROM), RAM goes blank when the computer's power is turned off. Not a problem, really. The computer system user merely copies RAM data onto a disk before shutting down. When the computer is turned back on, the recorded infomation can be copied back into RAM.

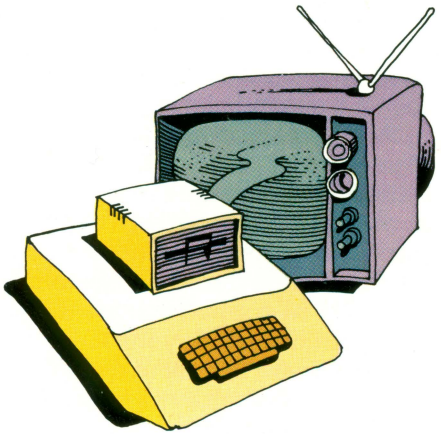
The more RAM a computer has, the more it can do. A computer with more RAM can be loaded with longer, more powerful programs. The computer also has more room for holding the information it's generating. That means the machine can work on larger, more complex jobs of every kind. The more RAM, the better. However, RAM, like lunch, is never free, a fact discussed under "What Will It Cost" (pages 37–39).

The capacities of all computer memory—RAM, ROM, and disk drive—are measured in the same units, called bytes. A byte is simply an eight-part code that stands for a single character (letter or number). Each part of the code, by the way, is called a bit.

The computer uses bytes the way people use letters and numbers. By stringing bytes into unimaginably vast arrays, a computer can count or spell anything a person wants it to. The computer also handles all the translating, so users see normal letters and numbers displayed on the monitor or coming out of a printer. A computer stores these bytes by the thousands. A thousand bytes, called a kilobyte, or K, is the standard measure of memory size. Thus, "64K RAM" means that the computer's random access memory can hold approximately 64,000 bytes of information. A "256K disk storage capacity" means that a certain floppy disk can store about 256,000 bytes of information.

Note strictly for the record that 1K actually contains 1,024 bytes. If you think you care to know why, the glossary and your computer dealer will tell you. But forget all that for now. Everyone, including the manufacturers, rounds it off to 1,000 bytes even. You can do the same.

You've looked at CPUs, operating systems, and memory. They make up the basic computer itself. Next, you'll need to know about the devices you add that make a computer into a computer system.



A basic system will include a TV monitor plus a disk drive. A personal computer can actually be attached to your own television (with the help of a relatively inexpensive connecting device). But you may want a special video monitor. Those that are made exclusively for use with the computers offer one basic but significant advantage over ordinary TV sets: they're designed to give sharper images. This can make an enormous difference when you're working with a display screen full of numbers or words.

Like regular televisions, monitors come in various screen sizes, the most popular being 9 and 12 inches, measured diagonally. Though the smaller screens have their uses, 12-inch screens, unsurprisingly, are easier to read; they're virtually mandatory for word processing with 80-character lines. A video monitor, by the way, does not function as a TV set when detached from the computer; it only runs on computer signals. A video monitor costs more than a black and white TV, but it increases the computer's usefulness.

An ordinary cassette recorder can be used in lieu of a disk drive. However, you'll discover that with a cassette player it takes you ages to load programs and save data. When you're working with anything

A computer system, like a TV, is only as useful as the program it's running. That makes it important to know how to buy good software.

Go to a computer store and tell the salesperson that you want to talk about programs. Tell him what kind of work you want to do. For each category—budget work, word processing, and language study, for example—the salesperson will pull out two or three programs.

In the face of so many bewildering computer programs, you may anticipate overwhelming confusion. Take heart, the salesperson will rescue you. One by one, he'll load each program into a computer and explain just a bit about how each works.

As you watch him use a program, you'll see functions that are especially impressive or especially confusing. Ask about them immediately; you should get lots of answers. Soon you'll have a feel for how software works and what makes one program better than another. Then grab all the brochures you can find and go home to do some studying.

In a week, you'll be ready to talk about the specific software you want. This, in turn, leaves you ready to talk about buying a computer system as well, one that will fit your purposes and your software perfectly.

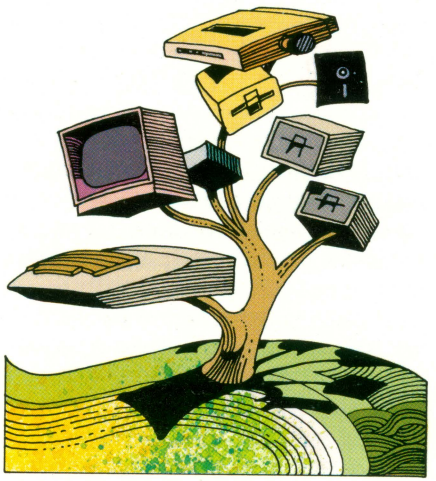
but tiny, limited programs, this can be extremely cumbersome. A disk drive moves data with far greater efficiency and—despite its higher cost—is really the only practical device for most people. It uses a recording medium that is similar to a small, flexible record in a square plastic sleeve. The entire disk, sleeve and all, is simply put into a slot in the front of the drive.

Whatever hardware you consider, think about how it can be used, adapted, or expanded to meet future needs as well as current ones. This is important, because once you get the hang of computing, you'll want to use your system for many applications you may not yet need or even be aware of. Currently, for example, you may want a system for doing office work at home. Later you may also want to send that work straight to your office by telephone—and that's when you'll be glad that you opted for an expandable system.

With some personal computers, expansion is a fairly simple matter. Just remove the computer's cover, find the expansion slots, and plug in a ready-made circuit board. If it's expandable, your system will let you add telecommunications equipment, printers, graphics plotters, and even control devices for operating lights, locks, thermostats, and many other kinds of equipment.

You can also add ready-made circuit cards that increase your computer's memory, its programming language ability, its operating system comprehension (thus its program library), and more.

In short, an expandable machine is able to grow with your interests and offers exceedingly good value. It's obviously cheaper to buy one system that can become more powerful than to buy a second, more powerful system to replace an unexpandable system you've outgrown. Perhaps the only people who shouldn't bother with an expandable system are those who already know that their system will only be applied to a few specific purposes. Everyone else would do well to look at systems that can grow with the user's growing interests.



All these matters pertain to the computer's "power." Recall, however, that this power must still be balanced against three other considerations: ease of use, cost, and service. As you examine these considerations, you'll realize they affect your system's usefulness fully as much as its inherent power.

Simplicity. Ease of use is probably the most immediate criterion, and certainly one of the most important, for choosing a personal computer. After all, a middling repair policy or high price tag will only vex you briefly. But a system that's hard to use—with poor instructions, a tinny and cluttered keyboard,

or cumbersome procedures—will aggravate you every time you sit down to use it. You'd do well to check for several important features.

First and foremost, examine the instruction manuals that come with the personal computer you're interested in. These books are vital, your most important key for unlocking the power of the machine. Initially, you'll use them a good deal for learning the basics. Later you'll refer to them for answers to your increasingly knowledgeable questions. Another way to look at it is this: if the books are your key, and you can't make sense out of them, then you're locked out of your computer.

All manuals are not created equal. If they're hard to follow, or incomplete, think twice about buying the machine. There's probably an equally good computer elsewhere, made better by good instructions. A computer dealer should be able to help you here. Ask him about the quality of any of his machines' manuals. If he doesn't know or isn't too concerned, go to another sales person, even another store, until you get some useful opinions.

Personal computer instruction manuals can be fairly imposing pieces of literature. But don't go into shock. Remember that the computer manufacturer provides all the instructions at once, even though you will only absorb them a bit at a time—over weeks, months, or even years. Further, you may never need to refer to some of the books, such as those for technical reference only.

Your computer's manuals should have several qualities. First, they should be wonderfully plain and clear, with sentences that are reasonably free of computer jargon. Second, they should be thoughtfully organized. Each table of contents should reflect this organization and show a sensible progression through the book's material.

Third, it's important that the books do more than simply drill you in one rote operation after another. Instead, they should give you a feel for the machine, should lead you to begin making connections on your own. In fact, some of the better manuals are written in such a way that readers actually realize how the machine works before finishing the instructions. They may *never* finish the book, but simply go on to use the machine and instruct themselves.

In summary, look at the books that come with your machine and see if they look promising. If they seem confusing or unorganized, check out other machines and other manuals. Keep looking until you find a set of manuals that will really help make a system effective.

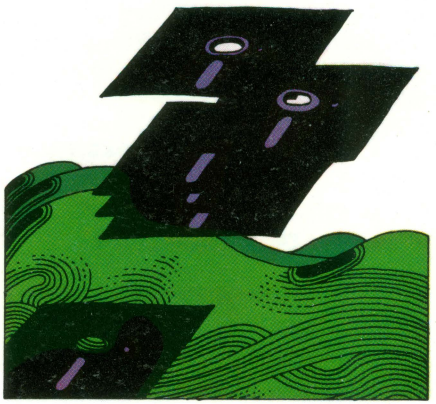
Now that you've done the hard work of scrutinizing the computer system's manuals, take on an easier but very important task. Give the computer's keyboard a test run. Whether you're considering inexpensive

or very expensive personal computers, they should have comfortable keyboards. The least expensive computers have, instead of keys, a one-piece, pressure-sensitive surface marked with typewriter key positions. This helps keep costs very low, but also makes typing glacially slow. Virtually all other personal computers use regular keyboards, like those on electric typewriters.

However, keyboard quality can vary a great deal. In fact, you would do well to test every brand. Some keyboards may look like those on fairly standard electric typewriters, but the keys won't "feed back" the way they should for sustained, high-speed typing. Other keyboards feel fine, but are poorly laid out, with too few or too many special-function keys, or with standard keys serving too many nonstandard uses. In the end, you'll find the best keyboards on only a few of the better personal computers.

Take time to examine several monitors as well. You'll quickly see the difference that screen size can make. To test image sharpness, get the sales person to display some 80-column, lower-case text on the monitors you're examining. Check the text display in standard mode (light letters on dark screen) and inverse mode (dark letters on light screen). If you want to use your system for games, look at some moving images, too. They shouldn't leave a lingering "ghost" after they move.

Finally, let it be said again: a personal computer's convenience and simplicity depends mostly on its software. Be *certain* that the machine you want not only has lots of software, but that the software and the manuals are simple, clearly written, and easy to use.

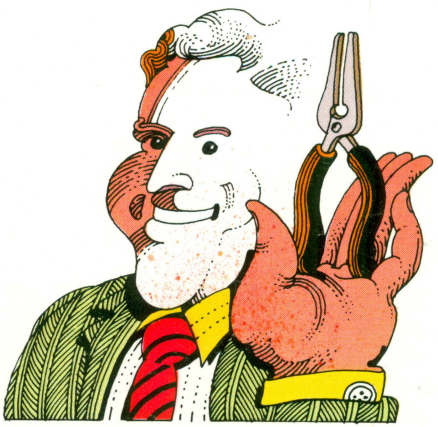


Cost. A machine's power and its ease of use should be balanced against a third factor—cost. More is said in "What Will It Cost" on pages 37–39. For now, simply consider two things. First a computer buyer's chief concern is not finding a price, but finding a solution. While busily saving a little here and a lot there, don't inadvertently buy a system that can't really do everything you want it to do. Second, recall that there is a big difference between the cost of a computer and the cost of a usable computer system. This fact of computing life will show certain of the low-cost computers to be not so low cost after all, while some of the more

expensive machines will look like a pretty decent value.

Service. Finally, think about service. The real issue, when your system won't run, is how quickly you can get things going again.

Your primary source of service is the dealer from whom you purchase your system (see "The Computer Store," pages 28–29). However, the kind of repair service a dealer provides for your system's hardware depends, in part, on the hardware's brand. Some computer companies require dealers to learn basic repairs for their computers. A dealer can fix those brands in one day, or maybe even less.



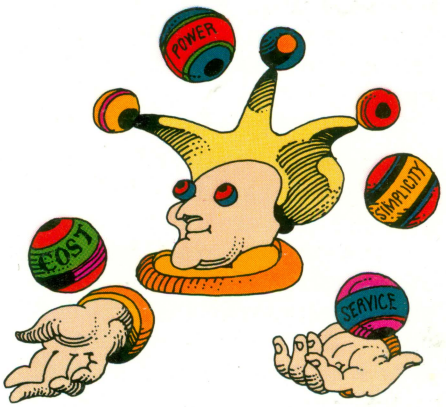
Other brands must be shipped to a central repair facility. Obviously, shipping for repairs takes longer—up to two weeks.

Computers are also sold by mail-order outlets, often at discount, but most of these outlets extend no service help. Caveat emptor. If you encounter problems or even have questions, you're on your own. For someone who really knows personal computers, has a source of good technical help, wants nothing other than a bargain on a very specific piece of hardware, and is willing to hazard cross-country shipping, a mail-order purchase may seem to make sense. Most users, however, need technical assistance—service that's established, accessible, and competent.

Finally, several computer companies sell a number of protection plans that will cover all repairs and maintenance on your machine for a yearly fee. Together with a helpful local dealer, such plans can assure the computer's uninterrupted well-being and the owner's peace of mind. These plans cost about 10 percent of a system's purchase price, but this expense must be weighed against the possible cost of repairs paid out of pocket. Whether a protection plan is a smart buy depends on how much use or abuse the computer will receive, and how much or how little you care to be involved in its maintenance.

Summing up. Buying a system's hardware, then, requires you to strike a balance between power, simplicity, cost, and service. Ask yourself that one easy question, "What do I want this computer system to do?" Your answer will tell you which of these criteria are most important to you and which system will give you what you want.

Having armed yourself with basic computer information and some very useful questions,



you're ready to look for a good place to shop.

The Computer Store

Because its products are so powerful and so little understood by the general public, a computer store has to provide customers with more help than perhaps any other kind of retail outlet. The sales people must know what they're selling in intricate detail. They must understand what you want and work to find it for you. After you buy, they must provide you with service and support. If you consign yourself to the care of a dealer who can't do all this, you could end up with an inadequate system and inadequate help in the future.

The stores. You'll encounter three general kinds of computer stores. There are independent dealers who set up and run their own businesses. There are franchise dealers who share ownership of their computer store with a centralized corporation. And there are department store chains that are starting to sell personal computers, some adding computer departments to certain stores, others selling the systems in their office products departments. Each kind of store has advantages and disadvantages.

Independent dealers usually put all their effort into just three or four different computer brands. The strategy is to achieve greater mastery of the systems they sell and thereby produce cogent demonstrations, better support— and, they hope, more sales. The approach is sound, providing the sales people really do know their stuff.

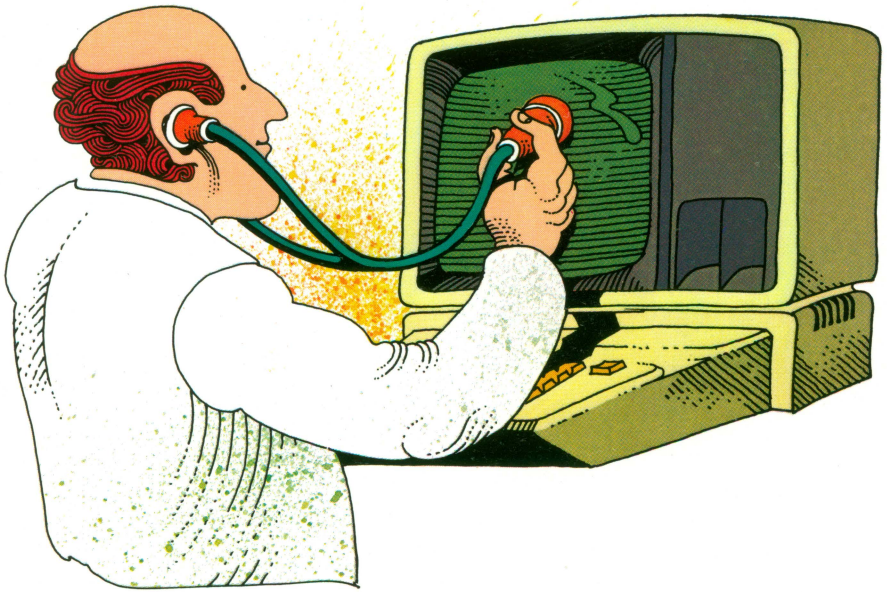
Franchise computer stores can show you most of the personal computer brands on the market. However, coping with this many systems can spread a sales person's expertise mighty thin. You might see more machines, but you might not learn much about them.

The department store chains hope to do for computer shopping what they've done for appliance and television shopping. Depending on the sales people you encounter, that could be good or bad.

Sales people. As you can gather, the most important element in each store is the sales person. A good one should quickly make it clear that your interests take priority over his or hers. If your sales person wants mostly to sell you a pet package, disengage yourself and find somebody else.

If you find that your sales person's heart is in the right place, then go on to discover if he or she has a real working knowledge of the store's computer products. A good salesperson should be able to give you a complete demonstration of all the software and hardware about which you're curious. And help you do a little hands-on experimentation, too. If this is the case, you may have the store you want.

Service and support. However, after the sales person has helped you choose the system you want, you must find out one thing more. Ask about the store's service and support policies. If your wonderful but mysterious machine becomes sick, a good dealer will expedite all repairs for you and may be qualified to repair the machine you buy. By exchanging plug-in chips and

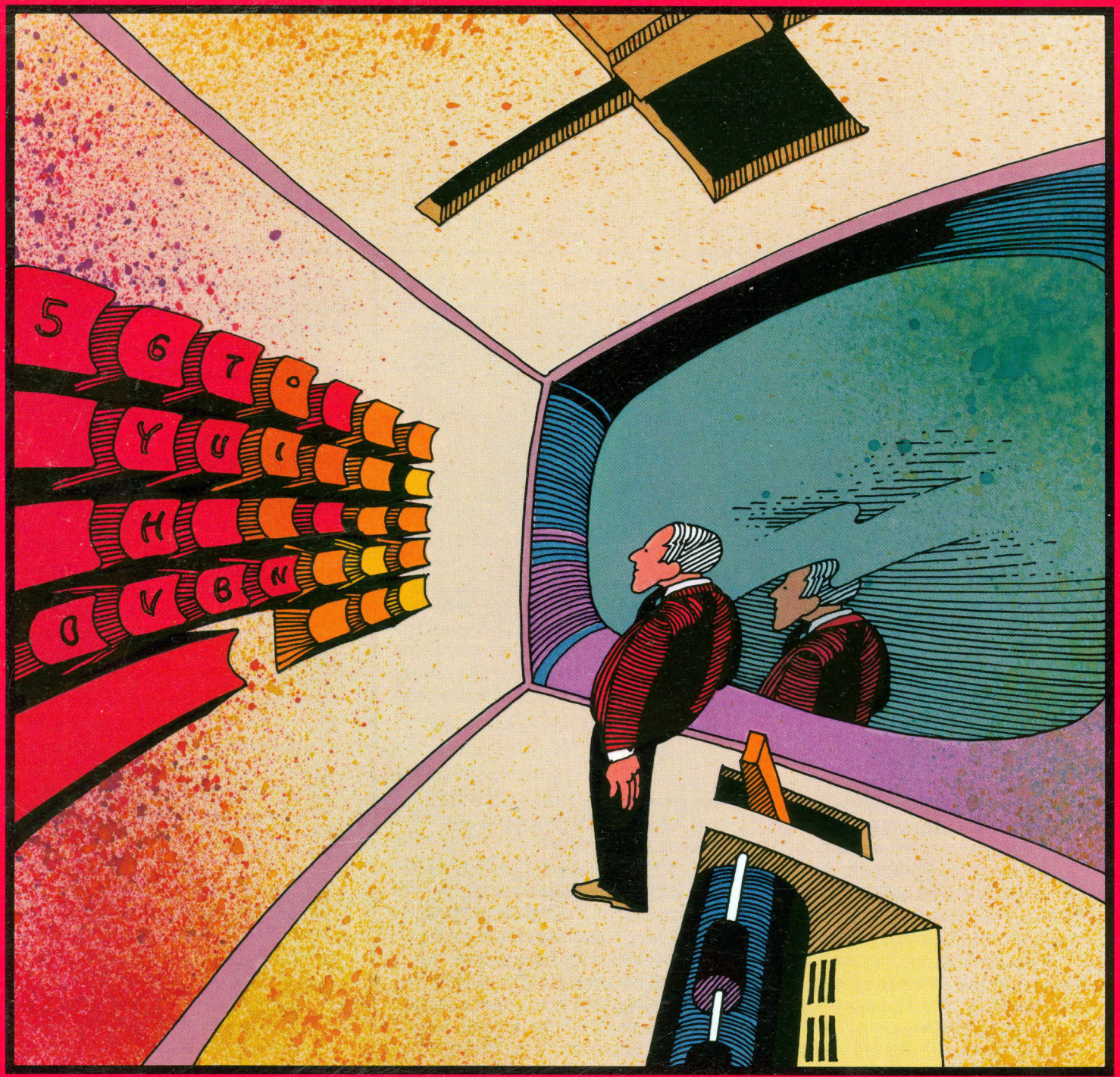


boards, a dealer may actually make repairs for you while you wait.

Support, on the other hand, means helping you get running. When you buy a system, your dealer should assemble and run it—both software and hardware—to make sure that everything works together as it should. The dealer should also familiarize you with basic setup and operating procedures. Finally, you should be able to call him if you have problems getting things going.

Good dealers frequently offer evening or weekend training seminars for a modest fee. Such seminars cover software and hardware and help you get started computing that much faster. For new users, the money is well spent. For an extra charge, some dealers offer additional support in the form of a hotline, a phone number you can call for answers to technical problems.

If you find a dealer who understands your purposes, can demonstrate all the software and hardware you care to examine, and provides good service and support, then you've found at least one good place to buy your system. ■

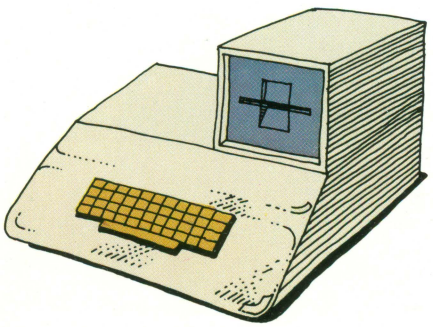

5
6
7
Y
U
H
V
B
N

How Do I Run This Thing?

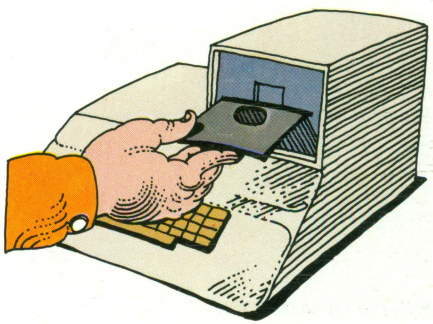
The following illustrations show you, in brief, how to set up and use a personal computer. Though the program in the example is simpler than most, it still gives you a good idea of the way programs work.

Getting Started

Setting up. Before you can use your personal computer, of course, you'll have to connect the computer with the disk drive and monitor. Once your system is put together, you can simply leave it together—moving it is really no harder than moving an electric typewriter.



Loading the program. To use the system, you simply put a program disk in the disk drive and turn on the power. The computer will automatically check the disk drive for a program diskette. Then, on its own or with a simple command, it will find your program, copy it into RAM, and display the program's starting point on the screen.



Using the program.

No. 1. Well-written programs give you plenty of directions. This simple program, called Basic Finance I, starts with a complete explanation of what the program can do.

```
1
BASIC FINANCE I----------COPYRIGHT 1978
        APPLE COMPUTER INC

THIS PROGRAM CALCULATES AMOUNT, PAYMENT,
DEPOSIT, INTEREST RATE (APR), NUMBER OF
PAYMENTS, BALLOON PAYMENTS, AND
AMORTIZATION SCHEDULES FOR LOANS, LEASES
AND SAVINGS  ACCOUNTS.
HIT RETURN WHEN READY.
```

No. 2. Tapping the "return" key brings up the program's next instruction screen, which lists several ways to put the program to work. In this example, we want to compute the monthly payments on a car loan. Therefore, we type in "2," as shown on the bottom line, and hit "return."

Nos. 3–6. The program automatically asks some questions. Entering answers prepares the computer to do multiple calculations about the loan. We tell the computer to work with a 60-month, $10,000 loan at 18 percent.

2

```
BASIC FINANCE I----------COPYRIGHT 197?
        APPLE COMPUTER INC
YOU MAY CALCULATE ANY OF THE FOLLOWING:
1 INTEREST RATE (APR)
2 PAYMENT/DEPOSIT AMOUNT
3 NUMBER OF PAYMENTS/DEPOSITS
4 TOTAL AMOUNT OR,
5 BALLOON PAYMENT
WHICH (ENTER BY NUMBER PLEASE) ? 2
```

3

```
        APPLE COMPUTER INC
OK. NOW I NEED TO KNOW THE FOLLOWING:
ANNUAL INTEREST RATE (APR) IN % ? 18
TERM OF THE ACCOUNT:
YOU MAY ENTER ANY COMBINATION OF YEARS,
QUARTERS, MONTHS, WEEKS, OR DAYS
NUMBER OF YEARS ?
NUMBER OF QUARTERS ?
NUMBER OF MONTHS ? 60
NUMBER OF WEEKS ?
NUMBER OF DAYS ?
```

4

```
WITH INTEREST TO BE COMPOUNDED:
1 YEARLY
2 QUARTERLY
3 MONTHLY
4 WEEKLY
5 DAILY
WHICH ? 3
```

5

```
WILL YOU BE MAKING:
1 MONTHLY PAYMENTS/DEPOSITS, OR
2 A SINGLE PAYMENT/DEPOSIT ONLY...
WHICH ? 1
```

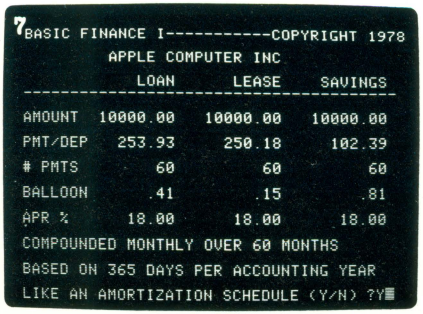
6

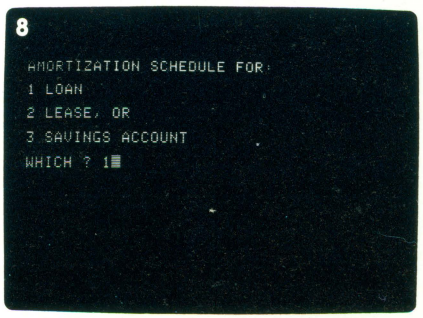
```
ENTER TOTAL AMOUNT ? 10000
```

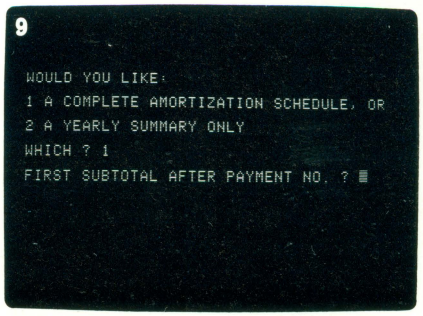
No. 7. After answering the final question, we hit the computer's "return" key, producing an almost instantaneous response. The computer automatically displays a chart showing the monthly cost for the $10,000 loan, over five years, compared with leasing the car or putting the money into savings. Our 60-month car loan, shown below, would cost $253.93 per month. The computer asks if we also want to see the five-year amortization schedule for the loan. Why not? We type in "yes."

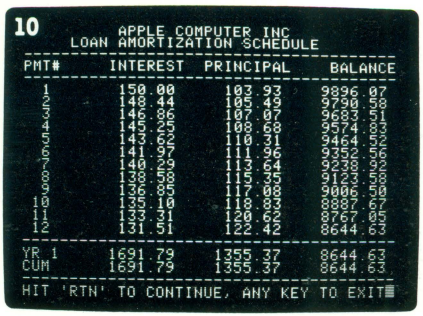
Nos. 8–9. We answer the questions, hit "return"...

No. 10. ...and, almost instantly, the computer displays the first 12 months of the complex schedule. By continuing, we can examine the entire schedule. By exiting, we can start again, experimenting with other loan amounts, interest rates, repayment periods, and so forth.







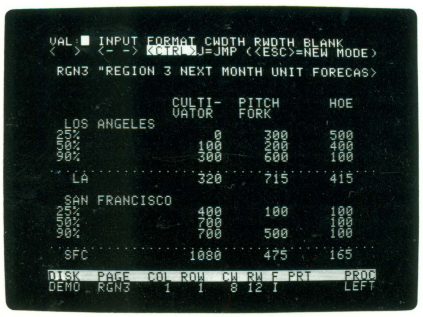


The Real World

Other programs. The programs you're likely to use most, however, have abbreviated directions that are initially harder to follow. Don't be dismayed. You'll quickly find them far simpler to use than longer directions, which have at least two drawbacks.

First, a user memorizes most program directions in short order. Once this happens, wading through long and numbingly familiar directions becomes tedious. Second, "hand-holding" directions like those in "Basic Finance I" use up large chunks of computer memory space—space that could be used to expand the capabilities of the program.

A more typical program screen looks like this:



On the main screen for Senior Analyst, a powerful financial-modeling program, directions and controls are abbreviated on the top and bottom lines. The abbreviations are explained in the program's instruction manual. With them you command the computer to arrange and label the "worksheet's" columns and rows, to enter information (new or from storage), to automatically perform various mathematical operations on the information, and more. Also, the program's commands can be used in any sequence and at any time.

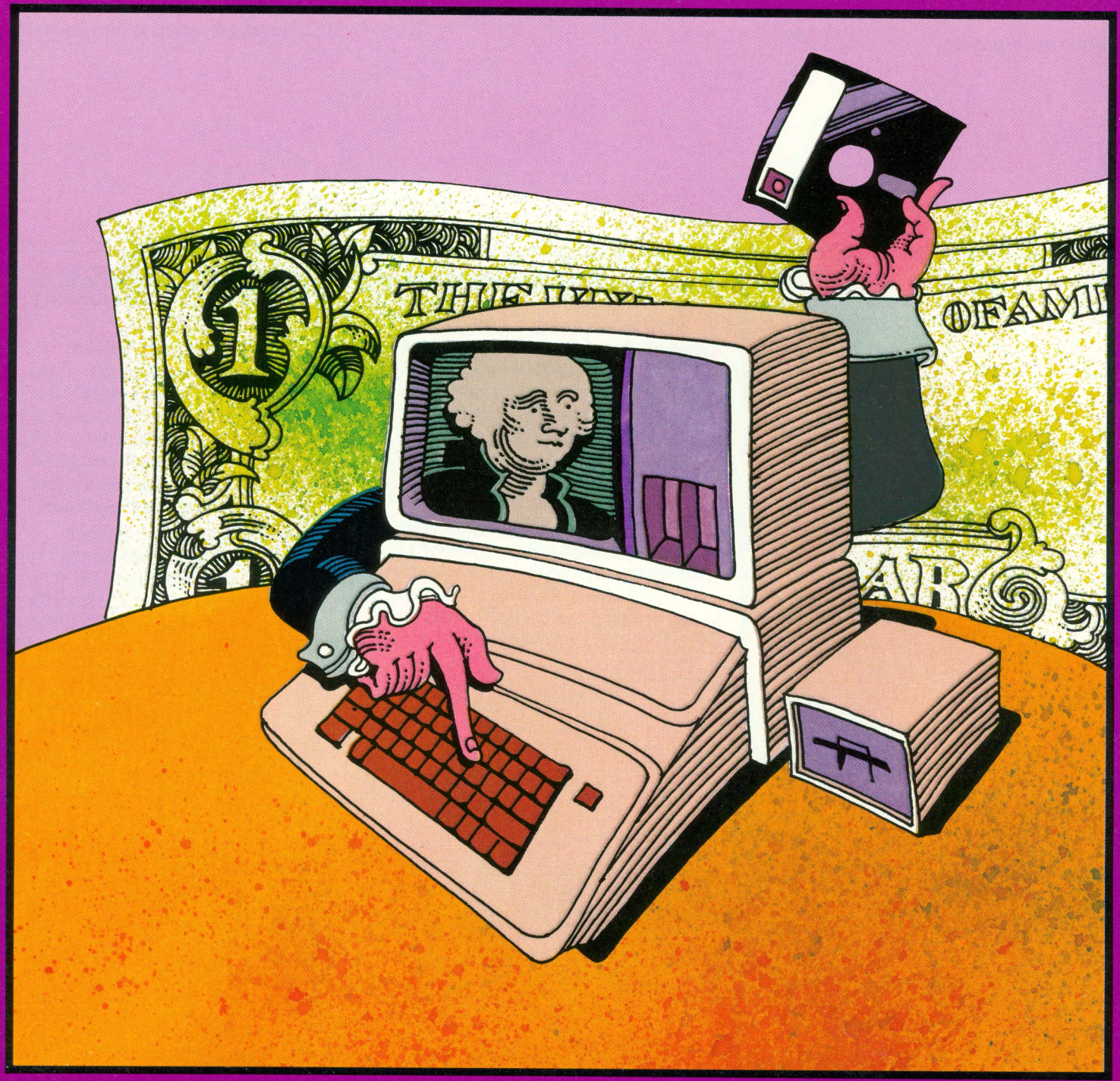
Information shuffled back and forth between a computer and its disk drive is in little danger of being damaged or lost in transit. The reason is that only copies of the information are moved. The original information is still stored in the disk drive.

The computer uses the disk drive to make a permanent record of any information the user wants to save. The disk drive works like a very fast tape recorder, recording information on a magnetic medium, the floppy disk. Like information recorded on tape, information "written" on disks is safely stored for future reference.

When the user needs that stored information, he tells the computer to "load" the information into its own short-term memory (RAM), where the data can be examined and revised. The computer looks up the data on the disk, "reads" it, and copies it into RAM.

But note that the information in RAM is just a copy. The permanent record is still safely tucked away on the disk. The user can modify or even wipe out the computer's RAM copy and nothing will be lost. The disk's permanent record remains untouched.

The user can keep that permanent magnetic recording as long as he wants. He can copy it into RAM as many times as he wants. And when he has no further use for the original, he can record over it—something that's as difficult to do unintentionally on a computer as it is on a tape recorder.

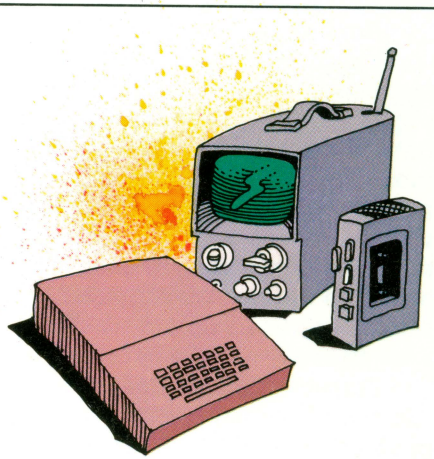


What Will It Cost?

What a personal computer costs is a function of what you want the computer to do. Usually, the more it does, the more it costs.

Typical Systems

Because personal computer costs vary considerably, you should get specific prices from a computer dealer. Remember, though, that *system* costs, not just computer costs, are what you're interested in. For this reason, it's useful to describe several typical personal computer systems and identify the kind of work they do.

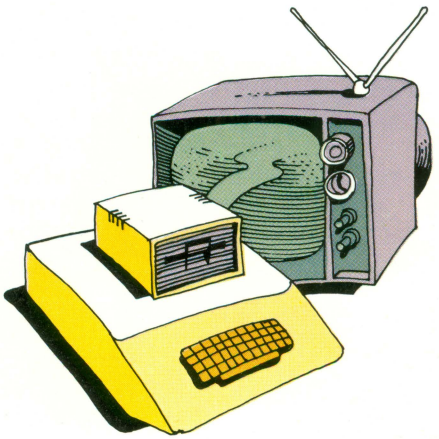


System #1. A starter system might consist of three components—a 16K RAM computer, a cassette tape player for I/O, and a standard TV. The great virtue of such a system is that it keeps costs to a minimum while introducing you to the wonderful mysteries of computing. With it you could explore short educational programs, a programming language and, happily, not a few games.

Functions like accounting and word processing, however, require a machine with more memory, usually a minimum of 48K. Furthermore, starter systems are not expandable and lack the professional feel of more substantial machines. Finally, the tape deck makes data storage and retrieval intolerably slow, and the TV does a relatively poor job of resolving images.

Starter computers generally have full keyboards, though some use calculator-style keys which preclude touch typing. On several starter computer keyboards, the arrangement of special keys is confusing.

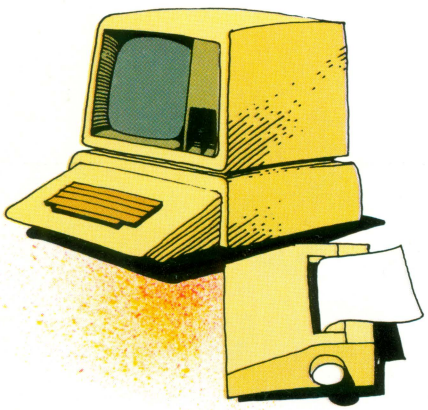
System #2. The second representative system is likely to be built around a more powerful, more expensive computer with at least 32K of memory. This system is faster and easier to use because it includes a disk drive. The family TV may still be doing monitor duty. This system is more potent than the first for several reasons. The computer's 32K RAM is large enough to handle more powerful programs. Also, the disk drive stores and retrieves data much faster and more reliably than a cassette recorder. Consequently,



programs can be longer and more elaborate. This system can be used for financial matters, such as balancing checkbooks and solving budgeting problems. It can also be used for word processing jobs (such as letters and memos) and for many filekeeping tasks.

System #3. The third representative personal computer system is the most powerful, the most adaptable, and the most expensive.

At the heart of the system is a 48K computer, expandable to 64K. Coupled to this computer are one disk drive, a high-resolution monitor, and a printer. The system's printer lets you make printed copies of all your work—letters, research papers, office reports, and so forth.



System #3 can do all that the other systems do and more. In its simplest configurations, it can handle extensive budgets and financial models, long word processing projects, mailing lists, and lengthy files. By adding more internal memory, more mass storage, and peripheral devices such as a data communications modem, this system becomes the sort of computer setup favored in corporate corner offices.

This system handles a number of especially powerful programs. VisiCalc®, for example, is an "electronic spread sheet"—a calculating program with a columns-and-rows format. Within these columns and rows you can set up and instantly calculate (and instantly re-calculate) the complex interlocking numbers that go into budgets, forecasts, and models. Word processing programs like Apple Writer use the system's additional RAM to make major reports, books, and other demanding projects easier to write and edit. A variety of other programs do sophisticated graphics—charts, graphs, maps, and so forth—for business and educational applications. In color, yet.

These popular and powerful programs are only part of the story. The vast majority of programs—software libraries of several thousand volumes—have been written for this kind of system. Even highly specialized programs are available. Need to calculate a year's feed costs for 200 dairy cattle? Care to simulate a nuclear reactor? You can buy such programs for system #3 right now. Last but not least, the games that run on these machines are pretty impressive, too.

Because this system is so flexible, however, prices can vary a good deal. A low-cost version of this third system could be assembled around the 48K computer alone. This version would drop the printer and substitute the family TV and a cassette tape player for the other components. This holds total costs to about the price of the computer alone, plus the price of software.

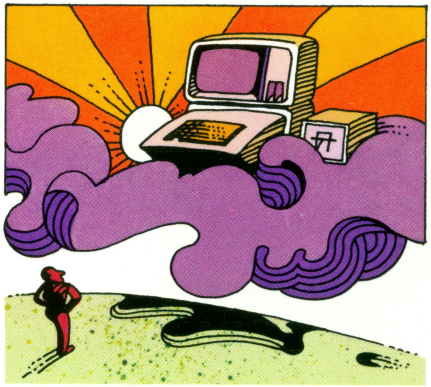
At the high end, the 48K computer could be increased to 64K or even 128K with the addition of plug-in RAM circuit cards. It could have two disk

drives for more convenient data handling, a high-resolution black and white (or color) monitor, a modem for communicating data to other systems by phone, and a high speed, letter-quality printer. Software could include word processing, calculating "spread sheet," business graphics, data communications (for using the modem), and perhaps one or two other programs tailored for specific technical purposes. A system like this is worth several thousand dollars—and is fully able to help you run a small business or part of a large one.

Expandability. You could save in the future if the computer you buy now is expandable. True, you'll pay for expansion accessories like circuit cards and more powerful peripheral devices. But the cost of replacing your nonexpandable computer with something more powerful could be higher still.

Costs And The Future

But perhaps you wonder if the smartest way to get a good price on a personal computer



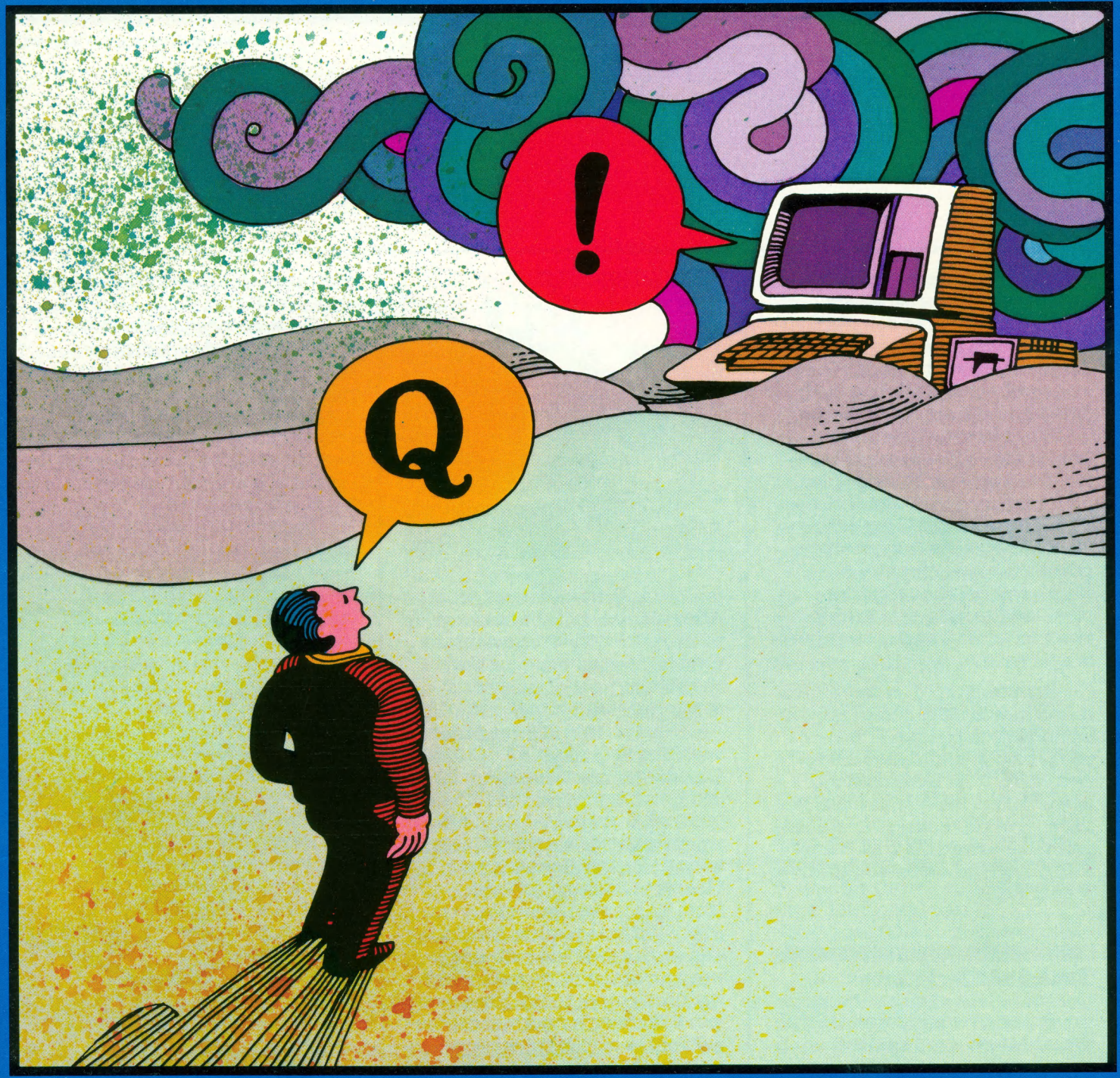
isn't simply to wait a few years. After all, couldn't the massive price reductions that swept the electronic calculator market in the '70s come to the personal computer market in the '80s?

Several facts argue against such drastic reductions. Chips for new computers are indeed dropping in price, but a computer also contains lots of plastic, metal, and other materials which *rise* in price each year. The same is true of labor costs. Most important, personal computer systems require enormous and continuing support—software and manual development, applications support, repair, and more. Such expenses were never part of the cost of calculators and digital watches. These hefty costs, which are related to wage scales, will rise.

Such factors will probably keep the cost of personal computers from plummeting in the near future—and perhaps in the foreseeable future. Effective costs are decreasing, however. In fact, for years to come, computers that do more for less will continually appear.

In the final analysis, the ultimate personal computer will always be in the future and therefore unavailable. The dilemma for buyers is this—will the disadvantages of one's current computerlessness be outweighed by the advantage of a future price reduction? The telephone's early days illustrate the problem. In 1924, the phone cost more and did less than today. It was, nevertheless, a radically powerful communicating tool and those who used it presumably gained more than those who decided to wait for the perfect phone—another device whose appearance is always in the future.

■


!
Q

Questions And Answers

Q. Computers are so new to me that I don't even know where to begin. Where do I?

A. Start with your own interests and ask yourself if a computer can help you with them. It's that simple. If you don't think you'll benefit from buying a computer now, wait.

Q. I'd get a computer tomorrow if learning to use it weren't so complicated. Isn't there a simple way into all this?

A. The answer, perhaps, is "Simple compared to what?" Learning to use a computer probably takes less time than learning to drive a car, and most people think learning to drive is pretty simple. The fact is that computers seem complicated because they're so new. Once you're around them, you begin to understand them quickly. In fact, for people who have grown up around computers—your kids, maybe—learning to use a personal computer seems quite natural. However, for the vast majority who came to maturity without personal computers, it seems difficult. In their case, the answer is either that there is no simple way or that the simple way is to take the plunge.

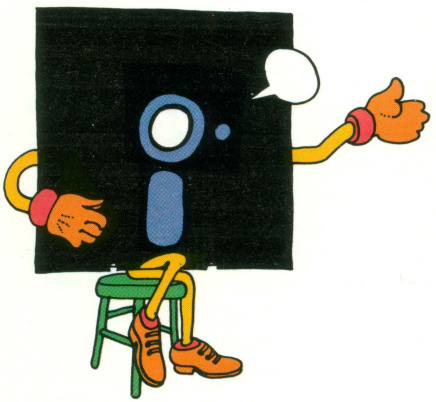
Q. Does a personal computer become a personal pain in the neck, like the computers that do my bank statement and my electric bill?

A. Nope. In fact, you'll find that a personal computer is utterly under your control. If it ever refuses to cooperate, you can, *in extremis*, simply turn it off. And you'll find that a computer rather quickly loses its mystique. One day soon, you'll look from your computer to your calculator laying mute and bland in your desk drawer, and you'll see the strong family resemblance. A computer is just an overgrown calculator, about as uncontrollable as a light bulb.

Q. How do I actually learn to use a program?

A. Start by loading the program into your computer. Some simple programs—games, for example—begin by explaining themselves. However, you'll learn most programs through experimentation guided by the program's instruction manual. Poor instructions make this process difficult, leaving you to figure out not only the program but the wretched directions as well.

Learning your first program will almost surely seem strange



and slow. Don't be dismayed; this is a perfectly normal first encounter. After you learn two or three programs, the strangeness fades. Learning all others is far easier.

Rather quickly, the program's commands will occupy only the back of your mind, in the same way that a car's controls—clutch, brake, gas, and so forth—are only at the back of your mind when you drive. You're free to focus on the problem you want your computer to solve.

Q. Is computer information safe to store? If I put my tax records on a disk, am I taking a risk that they might be destroyed?

A. Your disk records may actually be safer. First, like a phonograph record, a disk can retain its information quite a long time when properly stored and handled. Second, because you can copy a disk containing the year's tax records in roughly 20 seconds, you could produce several complete and extremely compact copies of your tax records in less than five minutes. That's probably several times the number of copies you currently have. Put one in your safe-deposit box, if you want.

Q. Something as complex as a computer system must be terribly sensitive. Aren't the odds pretty good that I'll somehow fry the computer or the program?

A. Against all expectation, a personal computer system and its data are really quite rugged.

The system's monitor needs no more care than a regular TV. The disk drive won't take abuse, but it requires no special handling. The computer itself is perhaps the least delicate system component. Its integrated circuits have no moving parts and are as rugged as those in a transistor radio, though heavy and prolonged vibration may cause chips to become unseated from their sockets. Such vibration must presumably be heavier and more prolonged than that aboard the space shuttle during launch, inasmuch as an Apple computer on the shuttle's second flight operated without a hitch.

Computers are not without their weaknesses, of course. Extreme humidity, enough to form condensation inside the computer, can cause short-circuiting. Don't use your computer system in the shower.

Of greater concern is static electricity. Pick up a static charge from your carpet or your cat, stick your ungrounded finger in the computer's innards, and you might instantly ruin any chip you touch. If you must use a computer amid heavy static, remember to touch metal before you touch the computer.

Computer data, on disks and in the computer, are also pretty tough stuff. When you've loaded the computer with your own stored data and are ready to work, don't worry about making irreversible errors. You can always reload the computer with a fresh copy of the data from storage.

However, if you don't pay attention to what you're doing, you may run into two problems. You might lose new data by turning off the computer before saving your work permanently on a disk. You might also confuse information you want to keep with information you want to eliminate. The computer will follow your orders blindly, so think twice about the commands you're using before activating them.

There are also a few general hazards that data cannot withstand. In the same way that they ruin tape recordings, magnetic fields will irretrievably scramble information on disks. Therefore, never lay a disk on top of a color

TV, large loudspeaker, electric motor, or other device with magnets in it.

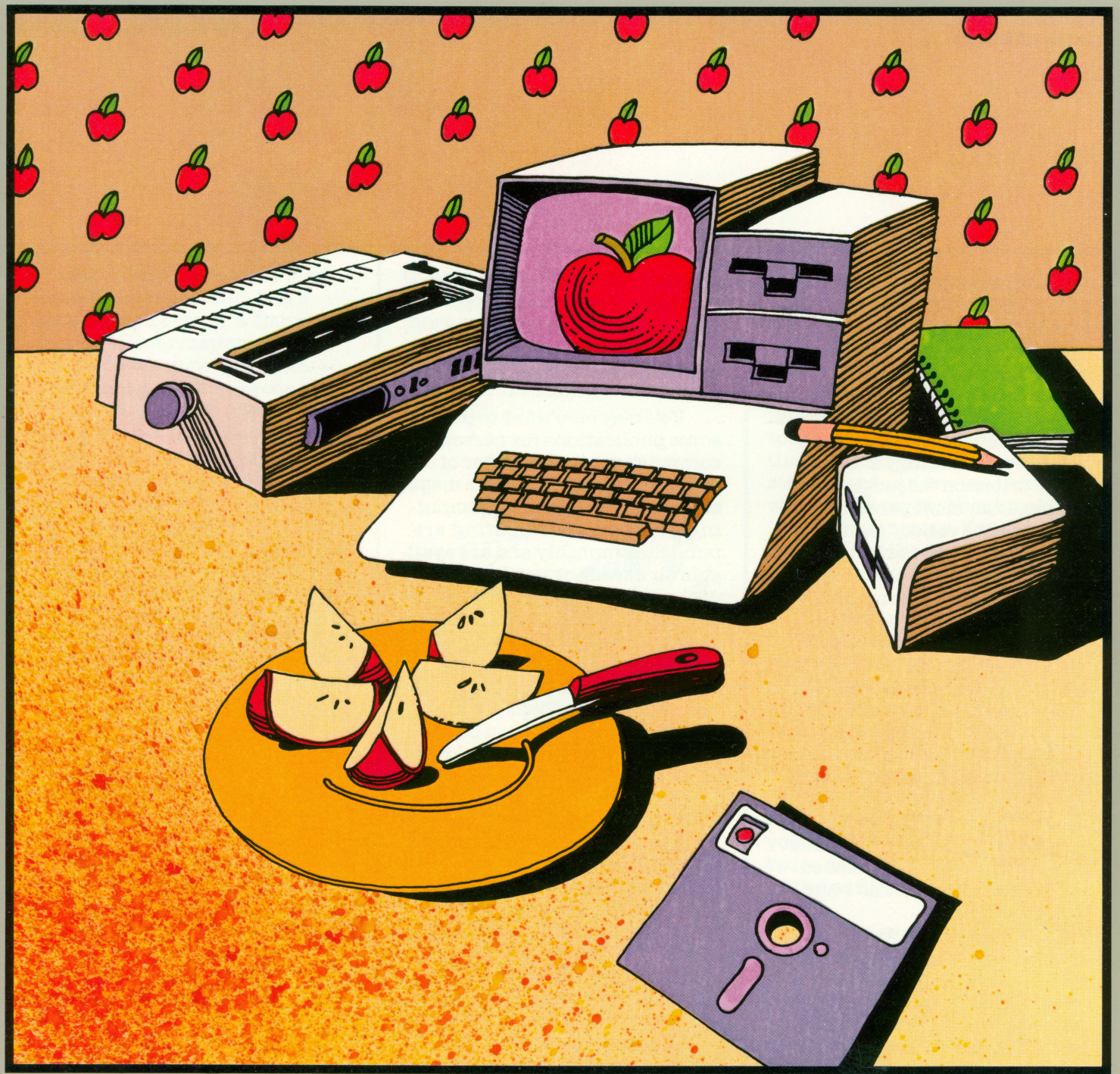
Q. If I buy a computer now, will it become outmoded quickly?

A. That depends on how you think about computers. If sizzling new technology is the single criterion for judging a system, then most personal systems could be called "outmoded" before they ever go on sale. If a system is judged by its utility, however, then the computer you buy now may never be outmoded. It will always be an effective problem-solving machine. True, it won't do as much as its descendants presumably will. Then again, today's personal computer will always do more than a thousand people with paper and pencils can do.

Q. I plan to get a personal computer soon, but first I want to talk with some experienced computer users. How do I find them?

A. By finding a local computer-users' group. These associations of computerphiles have sprung up all over the country and are an excellent source of information, ideas, and assistance. Groups in your area will include people whose computer interests range from the basic to the complex. Your computer dealer can put you in touch with virtually all of the groups near you.

You may also want to peruse some publications for personal computer users. A number of general interest computer magazines, such as *Personal Computing* and *Popular Computing*, are published monthly and are available on newsracks and in computer stores. Special interest magazines like *Softalk* and *Nibble*, aimed at users of specific kinds of computers, are also available. These special interest publications will be especially valuable to you after you buy your system and begin exploring it fully.



Apple Systems

Plain and simple, we want you to buy an Apple computer. However, we've tried to refrain from making Apple the hero of this book for two very sensible reasons. First, readers see through that sort of thing. Second, when people draw their own conclusions about personal computers, Apple seems to do pretty well. Here are five reasons why.

Our Point Of View

One. Apple has more experience with personal computers than anyone—we invented them. And they're our only business. That's why Apple's engineering and performance are so good that they set the standard for the industry. For the whole story, ask a computer dealer for our hardware and software catalogs.

Two. There are literally thousands of programs available for Apple computers—more than for any other computer ever made. And by simply plugging in an additional circuit board, an Apple computer will also run hundreds of programs written for CP/M® operating systems.

Three. Apple is famous for its clearly written, self-teaching instruction manuals. You'll also find a wealth of help and information in Apple dealers' training classes and in Apple users' groups.

Four. Apple is the most flexible personal computer available. You can use it with a cassette player and TV to make a starter system with full power. Then you can use its eight expansion slots to simply plug in hundreds of home, scientific, educational, and business accessories.

Five. Apple service is outstanding. More than 1,000 authorized Apple service centers nationwide can perform most repairs while you wait. You can also protect your investment with the Apple Extended Limited Warranty, a protection policy that covers your entire system, including system software.

Ad Infinitum. Those are just some of the reasons why Apple computers look so good to so many people. For the entire story, drop into any personal computer store and ask about Apple. Or talk with any of the half million people who drew their own conclusions and bought an Apple personal computer.

We think you may do the same.

Personal Computer Glossary

Most of the computer terms used in this book are defined below. Other frequently used computer terms are included as well, so this glossary may help clarify future computer conversations and readings.

acoustic coupler. A mechanical device that allows a telephone handset to be connected to a modem. The term is sometimes used to refer to the entire modem. See *modem.*

address. A number that identifies the specific location where a piece of information is stored in the memory of the computer.

alphanumeric. Characters consisting of letters and numerals, as opposed to special characters. See *special character.*

application program. Software designed for a specific purpose (such as accounts payable or receivable, payroll, inventory, and so forth).

ASCII. American Standard Code for Information Interchange. Computers use binary numbers to represent letters, numerals, and special characters. The ASCII code specifies which binary number will stand for each character and provides a standard that allows computers from different manufacturers to "talk" to each other.

assembly language. A means of communicating with a computer at a low level. Assembly language lies between high-level languages (such as BASIC and Pascal) and machine language (the ones and zeros the computer understands at its most basic level). Programmers use assembly language to make efficient use of memory space and to create a program that runs quickly. See *machine language.*

backup. An extra copy of information stored on a disk. If the program or other data stored on the first disk becomes damaged, it is still available on the backup copy.

BASIC. Beginner's All-purpose Symbolic Instruction Code. The most used high-level language for small computers.

baud. A measure of the speed at which computer information travels (normally between a computer and a peripheral or between two computers). A baud is equal to one bit per second.

binary numbers. A numbering system that uses only ones and zeros. It is an efficient way of storing information in a computer because the hundreds of thousands of microscopic switches in a computer can only be on (1) or off (0).

bit. A binary digit (1 or 0), the smallest item of useful information that a computer can handle.

boot. To "start up" a program. See *bootstrap.*

bootstrap. A piece of software, usually stored permanently in memory, that activates other pieces of software in order to bring the computer from "off" into readiness for use.

bps. Bits per second. A measure of data-transmission speed showing the number of bits of information that pass a given point in one second.

bubble memory. A new method of storing information for a computer using microscopic magnetic bubbles. Although the technology was developed almost a decade ago, it is still expensive and not generally available for small computers.

bug. An error. A hardware bug is a malfunction or design error in the computer or its peripherals. A software bug is a programming error.

bus. The means used to transfer information from one part of a computer to another.

byte. A sequence of bits that represents a single character. In most small computers, a byte is eight bits.

CAD/CAM. Computer-Aided Design/Computer-Aided Manufacturing.

CAI. Computer-Aided Instruction. Teaching by means of a computer,

normally involving interaction between the student and the computer. The computer informs the student of right and wrong answers as he makes them, and is able to respond to the student's emerging proficiency.

central processing unit. See *CPU.*

channel. A path for the transmission of information between two points.

character. A single letter, number, or other symbol. In a small computer, a character is normally represented by eight bits (one byte).

chip. A generic term for an integrated circuit (IC), a single package holding hundreds of thousands of microscopic components. The term comes from the slices (chips) of silicon of which they are composed.

clock. In a small computer, a repeating signal (usually millions of cycles per second) that controls the microprocessor "brain." Each time the clock sends a pulse, the computer performs a single task.

command. A word or character that causes a computer to do something.

compiler. A piece of software that takes a series of commands written in a high-level language (easy for people to use) and translates them into a lower-level language more effective for the computer to use.

computer. Any device that can receive and then follow instructions to manipulate information. In any computer, both the set of instructions and the information on which the instructions operate may be varied from one moment to another. A device whose instructions may not be changed is not a computer. The distinction between a programmable calculator and a computer is that the computer can manipulate text as well as numbers, whereas the calculator can only handle numbers.

computer network. Two or more connected computers that have the ability to exchange information.

computer program. A series of commands, instructions, or statements put together in a way that tells a computer to do a specific thing or series of things.

control characters. Characters or commands obtained by holding down the key marked "CONTROL" while pressing another key on the keyboard.

CP/M. Control Program/Microcomputer. See *operating system.*

CPU. Central Processing Unit, the heart of a computer. The CPU controls all operations of all parts of the computer and does the actual calculations. In personal computers, CPU usually refers to just one of the chips in the machine.

CRT. Cathode-ray tube. A TV-like device used with most small computers to display the information the computer has generated.

cursor. A position indicator on a CRT. It's normally a flashing or nonflashing square or rectangle.

data. A general term meaning any and all information, facts, numbers, letters, and symbols which can be acted on or produced by a computer.

data base. A collection of related data that can be retrieved by a computer, such as a mailing list or list of accounts.

debug. To go through a program to remove mistakes.

diagnostics. A specialized program that checks the computer for problems and tries to isolate any problems that it finds.

disassembler. A program that translates a computer's native language into assembly language.

disk (also diskette). A round piece of magnetic-coated material, either rigid metal or flexible (floppy) plastic, used to store data with greater density, speed, and reliability than is available on cassettes. See *floppy disk.*

disk drive. A peripheral device that can store and retrieve information on a disk. See *disk.*

display. A method of representing computer information in visual form. The most common ways of representing computer information are via CRTs and printed paper.

documentation. (1) The instruction manual for a piece of hardware

or software. (2) The process of gathering information while writing a computer program so that others using the program are able to see what was done.

DOS. Disk Operating System. See *operating system.*

downtime. Any period of time when the computer is not available or not working.

firmware. A term referring to software that has been permanently placed in memory, usually into ROM (read-only memory).

floppy disk. A thin, flexible disk of plastic with a magnetic coating used for data storage. The usual disk sizes employed with small computers are 5 1/4" and 8".

flowchart. A common method of graphically planning what a piece of software should do before the actual writing process begins, or for describing what it does after it is written.

FORTRAN. FORmula TRANslation. A high-level computer language used primarily for mathematical computations. Although FORTRAN is available for some small computers, it is mainly used with large commercial systems.

hard copy. A paper printout of information produced by the computer. See *printout.*

hardware. The physical part of the computer (such as the CRT, CPU, memory) as opposed to software.

hexadecimal numbers. A number system with the base of 16. It is commonly used by programmers to indicate locations and contents of a computer's memory.

high-level language. Any programming language that allows a person to give instructions to a computer in English-like text rather than in the numerical (binary) code of ones and zeros that the computer understands. BASIC and Pascal are examples of high-level languages.

impact printer. See *printer.*

initialize. To prepare a disk so that the computer can later store data on it.

input. The transfer of data into the computer.

input/output. Called I/O for short, this is a general term for 1) the external equipment (such as a modem or printer) connected to a computer and 2) the two-way exchange of information that goes on between the computer and that equipment.

integrated circuit (IC). Also known as a chip, this is a group of interrelated circuits in a single package. See *chip.*

interactive. Describes a computer system in which a two-way conversation goes on between the user and the computer.

interface. A piece of hardware or software used to connect two devices (computers and peripherals) that cannot be directly hooked together.

interpreter. A computer program that translates a single line of a high-level language at a time for the computer. Interpreters are more convenient but less efficient than compilers. BASIC is generally used as an interpreter, while FORTRAN is a compiler. See *compiler.*

I/O. See *input/output.*

K. Abbreviation for kilobyte, which means one thousand bytes. Actually, a kilobyte contains 1,024 bytes, the "extra" 24 bytes resulting from the computer's binary counting methods. A computer with "32K bytes of memory" has 32 X 1024, or 32,768, bytes of memory. See *byte.*

kilobyte. See *K.*

language. A set of conventions (symbols and terms) specifying how to tell a computer what to do.

letter quality printer. See *printer.*

line printer. See *printer.*

load. To put data and/or programs into a computer.

LSI. Large-scale integration.

machine language. The "native language" of a computer; those fundamental insructions the machine is capable of recognizing and executing. The instructions are represented in binary code (ones and zeros).

memory. Circuitry and devices that hold information in the form of

binary ones and zeros that the computer can access. Examples are main memory (integrated circuits), floppy disks, and cassette tape.

menu. A list of commands that most ready-made programs will display on request.

microcomputer. A computer based on a microprocessor.

microprocessor. The central processing unit of a computer (usually in a single integrated circuit) that holds all the elements for manipulating data and peforming arithmetic calculations.

MIS. Management information system. The use of a computer for providing information useful to managers (such as inventories, sales, and accounts payable and receivable).

modem. MOdulator-DEModulator. This device allows a computer to communicate over phone lines and other communication media. It changes the computer's digital information into musical tones (modulating) and from musical tones to digital information (demodulating).

modulator. See *RF modulator.*

monitor. A television set, often one that is specially manufactured to be connected to a computer.

network. An interconnected system of computers and/or terminals. The components do not have to be physically close to one another and are often connected by telephone lines.

node. A station on a network. A node can be a computer or a terminal.

operating system. "Traffic cop" software that oversees the overall operation of a computer system. This group of programs acts as an intermediary between the hardware and the applications software. Any piece of applications software must be written for a specific operating system—DOS, SOS, CP/M, and so forth.

output. See *input/output.*

parallel. Two or more things happening at the same time. A parallel interface is one that can send a number of bits simultaneously. Contrast with *serial.*

Pascal. A high-level programming language named after the seventeenth-century French mathematician Blaise Pascal.

peripheral. A piece of equipment (usually hardware) that is external to the computer itself. The most common peripherals used with popular computers are disk drives, printers, and cassette-tape recorders.

personal computer. A general purpose computer that is inexpensive enough to be owned by an individual with a moderate income.

printer. An output device that produces a printed ("hard") copy of the information generated by the computer. A line printer prints a whole line of text at a time. A serial printer prints one character at a time. A thermal printer makes characters by applying heat to heat-sensitive paper. An impact printer makes characters by striking a ribbon and paper like a typewriter does. A letter quality printer produces documents of better-than-typewriter quality.

printout. A printed copy of the information produced by the computer.

program. 1) A set of instructions that tell the computer to do something. 2) To prepare the set of instructions.

RAM. Random access memory. The main type of memory used in a small computer. The time required for the computer to find one piece of information in RAM is essentially the same no matter where the information is stored. Also known as read/write memory because data in RAM can be easily changed.

RF modulator. A device that lets a personal computer use any ordinary television set for output. Also called simply a modulator.

ROM. Read only memory. Memory where information is permanently stored and cannot be altered. This form of memory is also random access.

save. To store a program on a disk or somewhere other than in the computer's memory.

scroll. To move all the text on the screen (usually upwards) to make

room for more text (usually on the bottom.)

serial. Things occurring one after the other. A serial interface is one that sends out one bit at a time. Contrast with *parallel.*

simulation. A computerized representation of something in action.

software. Programs or segments of programs. The term was coined to contrast with hardware—the actual mechanics and circuitry of a computer.

software house. A company that writes programs or customizes programs specifically to the needs of an individual customer.

SOS. Sophisticated Operating System. See *operating system.*

special character. A character that can be displayed by the computer, but is not a letter or numeral, such as: @";%!#$%@&*()_+/,.

system. An organized collection of hardware and software that works together.

system software. General-purpose programs that allow programmers to modify applications programs. BASIC may be considered part of the system software; so is the computer's operating system.

telecommunication. Transmission of data between a computer and another computer or terminal in a different location. This can be done with phone lines, satellites, radio waves, optical fibers, or other means.

terminal. A piece of equipment with a keyboard for input and an output device such as a CRT or printer. A terminal is used to communicate with the computer.

thermal printer. See *printer.*

timesharing. A process whereby the facilities of a single (usually large) computer are shared by a number of users. Timesharing requires large amounts of memory and special software to make it seem that each user has the whole computer to himself.

track. A section of a disk or tape.

users' group. An association of people who meet to exchange information about a particular computer or group of computers.

volatile memory. Hardware which requires continual electrical power to keep from losing information. Most RAM is volatile; ROM is not.

window. A portion of the computer's display that is dedicated to some special purpose.

word. A group of characters or data that occupies one location in the computer's memory.

word processing. The entry, manipulation, editing, and storage of text using a computer.

20525 Mariani Avenue
Cupertino, California 95014
(408) 996-1010
TLX 171-576

ISBN 0-9609780-1-1

Printed in U.S.A.

A2G0035 250K/4-83